

Sant Gadge Baba Amravati University, Amravati



Faculty of Science and Technology

Syllabus and Scheme

of

Teaching, Learning, Examination and Evaluation

Under NEP-2020

For

B.Sc. in FOOD SCIENCE

(3 Years UG Course)

All Semesters (I, II, III, IV, V & VI)

(Implemented w.e.f. Session 2026-27)

Submitted by Board of Studies

Biochemistry including Microbiology and Food Science

Sant Gadge Baba Amravati University, Amravati
NEP Syllabus
Three Year UG Programme
Faculty: Science and Technology
Programme: B.Sc. (Food Science)

Introduction

Food Science is an interdisciplinary branch of science that deals with the study of food, including its composition, chemistry, nutrition, microbiology, processing, preservation, quality control, packaging, safety, and laws related to food. It integrates principles of chemistry, biology, microbiology, nutrition, engineering, and management to ensure the production of safe, nutritious, and high-quality food.

The Bachelor of Science programme in Food Science has been designed in accordance with the objectives of the National Education Policy (NEP-2020). The curriculum aims to provide students with a strong foundation in Food Science along with practical skills, analytical abilities, scientific temperament, and entrepreneurial aptitude. The syllabus has been carefully prepared by considering recent developments in food science, technological advancements, industrial requirements, and societal needs.

The programme emphasizes both theoretical and laboratory-based training to develop competency in food analysis, processing, preservation, quality assurance, hygiene and sanitation, food microbiology, nutrition, food laws, and value-added food products. The practical components are designed to enhance hands-on skills, scientific observation, data interpretation, report writing, and problem-solving abilities.

The interdisciplinary nature of the programme enables students to understand the role of Food Science in various field.

Employability Potential of the Programme

The programme has been designed to align higher education with the emerging needs of the food sector and related industries. It equips graduates with the knowledge, practical skills, and professional competencies required for employment, higher education, research, and entrepreneurship.

Food Science plays a significant role in ensuring food quality, nutrition, safety, processing, preservation, packaging, and regulatory compliance. The curriculum provides comprehensive knowledge in areas such as:

- Food Chemistry
- Food Microbiology
- Food Processing and Preservation
- Food Quality Assurance and Quality Control
- Food Analysis
- Nutrition
- Food Laws and Standards
- Hygiene and Sanitation
- Food Packaging
- Product Development
- Entrepreneurship

Through laboratory training and practical exposure, students develop the technical competencies required in food industries, analytical laboratories, research institutions, and regulatory organizations.

The programme also promotes innovation and entrepreneurship by providing knowledge of small-scale and large-scale food processing technologies. Graduates of the

programme will also be well prepared for postgraduate studies in Food Science, Food Technology, Nutrition, Food Engineering, Dairy Technology, Agricultural Processing, and other allied disciplines offered by various universities and institutes across India.

Career Opportunities

Graduates with Food Science as a major subject have diverse career opportunities in government, private industries, research organizations, healthcare, hospitality, education, and entrepreneurship.

Some of the major career options include:

Education: Lecturer (after fulfilling eligibility criteria), Laboratory Instructor, Teaching in institutions offering Food Science, Nutrition, Catering, Hospitality, and Nursing programmes

Food Industries: Production Officer/Supervisor, Quality Control Analyst/ Executive, Food Safety Officer, Research and Development Assistant, Purchase and Marketing Executive

Government Sector: Food Analyst, Food Safety Officer, Quality Inspector, Technical Assistant in Food Testing Laboratories, Opportunities in Food and Drug Administration and allied government agencies

Healthcare Sector: Dietetic Assistant, Nutrition Consultant (with additional qualifications), Hospital Food Service Supervisor

Hospitality Sector: Food Production Supervisor, Catering Manager, Kitchen Supervisor, Chef (with professional training)

Entrepreneurship: Students can establish small- and medium-scale food enterprises involving the manufacture of beverages, Jams and jellies, Pickles, Tomato ketchup, Bakery and confectionery products, Traditional Indian foods, Spice products, Dairy products, Millet-based foods, Ready-to-eat and ready-to-cook products, Health and functional foods, etc.

The programme also prepares students for higher education and research in Food Science, Food Technology, Nutrition, Food Engineering, Dairy Technology, and other allied disciplines.

Transferable Skills

During the programme, students will develop several transferable skills that are valuable across various career paths, including:

- Analytical skills
- Laboratory skills
- Scientific observation
- Report writing
- Technical documentation
- Oral presentation skills
- Time management
- Creative thinking
- Problem-solving ability
- Planning and organization
- Teamwork and communication
- Data interpretation

Hence, Board of Studies in Biochemistry (Including Microbiology and Food Science) in its meeting held on 08/05/2026 resolved to accept the complete syllabus for B. Sc. in subject Food Science based on Choice Based Credit System (CBCS) as per NEP guidelines. The detailed syllabus for each paper is appended with a list of suggested readings.

THREE YEARS UNDERGRADUATE PROGRAM

B.Sc. FOOD SCIENCE under FACULTY: SCIENCEANDTECHNOLOGY

Board of Studies in Biochemistry including Microbiology and Food Science

Dr. Rachana. R. Pachori (Chairman) Professor and Head, Department of Microbiology, R.A. Arts, Shri M.K Commerce and Shri S.R. Rathi Science Mahavidyalaya, Washim	Dr. Anil M. Garode, ExProfessor & Head. Rajmata Jijau Nagar, Chikhli
Dr Vijay S.Wadhav, Professor and Head, Department of Microbiology, Sardar Patel Mahavidyalaya, Chandrapur.	Dr Niteen Phirke, Professor and Head, P.G.Department of Microbiology, Sant Gadge Baba Amravati University, Amravati
Dr Aarti R Deshpande, Professor and Head, Department of Microbiology Shankarlal Khandelwal College, Akola	Dr Dnyansagar Bhokare, Professor, Department of Microbiology Shankarlal Khandelwal College, Akola
Dr Kapil Kamble, Professor, P.G. Department of Microbiology, Sant Gadge Baba Amravati University, Amravati	Dr. Nilima Yashwantrao Bhoge Professor and Head, Department of Food Science Arts Science and Commerce College Chikhaldara Dist Amravati
Dr Kshitij Navinprakash Shah, Professor,Arts, Science and commerce College Chikhaldara	Dr. Yamini S. Patil, Professor and Head, Department of Microbiology, Shri. D. M. Burungale Science and Arts College, Shegaon.
Dr. Swati Nilesh Zodpe Associate Professor & Head, Dept of Microbiology, Shri. Shivaji College of Arts Commerce and Science Akola.	Mr Ajit Babruwahan Patil, Asst. Prof. & Head, Dept of Biochemistry, Ghulam Nabi Azad Arts,Commerce and Science College, Barshitakli Dist Akola.
Dr.Ashwini A Balode, Assistant Professor & Head, Dept of Biochemistry, Shri. Shivaji College of Arts Commerce and Science Akola	

PROGRAMME OUTCOMES (POS)

Students of undergraduate general degree programme at the time of graduation will be able to

PO1. Critical Thinking:

Take informed actions after identifying the assumptions that frame our thinking and actions, check out the degree to which these assumptions are accurate and valid, and look at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Effective Communication:

Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction:

Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Effective Citizenship:

Demonstrate empathetic social concern and equity-centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics:

Recognize different value systems including one's own, understand the moral dimensions of decisions, and accept responsibility for them.

PO6. Environment and Sustainability:

Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning:

Acquire the ability to engage in independent and lifelong learning in the broadest contexts of socio-technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

After completing the programme with Food Science as a subject, students will be able to:

1. Gain insight into Food Science, including its history and the fundamental properties of food.
2. Acquire skills in the use, handling, and maintenance of basic Food Science laboratory equipment.
3. Perform basic laboratory procedures related to Food Science.
4. Understand the integral role of Food Science and its interdisciplinary branches.
5. Acquire knowledge of the basic chemistry of food and its applications.

CREDIT DISTRIBUTION

Vertical al	Vertical Type	Credit Distribution							Total Credits	Grand Total
		I	II		III	IV	V	VI		
	(i) Three-year UG Degree Programme (Level4.5.to5.5)									
A	Major	4	4	Major	6	8	8	8	38	48
	(DSC)60-64			IKS	2				2	
	(Minimum50%ofTotalCredits)			Elective	0	0	4	4	8	
B	Minor (from same faculty of DSC) 18-24	4	4		4	4	4	4	24	24
C	Generic/ Open Elective Courses (OE)	4	4		2	2	0	0	12	12
	(faculty wise Basket Other than faculty of Major/Minor Subject) 10-12									
D	(i) Vocational Skill Courses (VSEC) corresponding to Major /Minor (Skill based/ Advance Practical wherever applicable) 8- 10	0	2		2	2	2	2	10	16
	(ii) Skill Enhancement Courses - SEC (Basket of skill courses approved by the University) 6	2	2		0	0	2	0	6	
E	(i) Ability Enhancement Courses (AEC)-Focus: Linguistic & Communication Skills (Eng.+ Modern Indian Language) 8	1+1	1+1		1+1	1+1	0	0	8	14
	(ii)Indian Knowledge System (IKS) 2 (Generic)	2	0		0	0	0	0	2	
	(iii)Value Education Courses (VEC)	2	2		0	0	0	0	4	
	Understanding India, EVS, Digital & Technological Solution. 4									
F	(i) Internships/ Apprenticeship correspondingtoMajor8OJT	0	0		0	0	0	4	4	18
	(ii)Field Projects/Community Engagement & Service (CEP) Corresponding to Major 4-6	0	0	2	2	2	0	6		
	(iii)Co-curricular courses (CC)	2	2	2	2	0	0	8		
	(health & wellness, yoga education, sports, fitness, cultural activities, NSS/NCC &Fine/ Applied/ Visual/ PerformingArts8									
	Total Credits	22	22		22	22	22	22	132	132

Examination, Evaluation and Assessment Scheme

The total marks for each course shall be based on the continuous assessment and semester end examination.

Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table:

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
A	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
B	Minor		30	9	20	6	50	20	25	10	25	10	50	20
C	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
D	VSC	Internal	--	--					--	--	50	20	50	20
	SEC	Internal	--	--					--	--	50	20	50	20
E	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS(Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
F	Internship/ Apprenticeship	Internal	Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum 50 marks per 2 Credit Course with separate activity weightages/ levels. A detailed SOP for this assessment process shall be prescribed separately.											
	FP/CEP													
	CC													

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

BSC FOOD SCIENCE

FIRST YEAR: SEMESTER – I

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/ Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major/ Minor Food Science	Theory 1	116200	Fundamentals of Food Science	2	2	6
			Lab/ Practical-1	116201	Fundamental techniques in Food Science	2	4	
	b.	Minor/ Major	Theory 1	-	-	2	2	6
			Lab/ Practical-2	-	-	2	4	
	c.	Generic/ Open Elective	Theory 1	116202	Principles of Food Preservation	2	2	4
			Theory 2	116203	Fundamentals of food processing	2	2	
	d.	SEC	Lab/ Practical-3	116204	Skills in determination of properties of food	2	4	4
	e.	AEC - English	Theory			1	1	6
		AEC –MIL	Theory			1	1	
		IKS- Generic	Theory			2	2	
		VEC	Theory			2	2	
	f.	CC	Outdoor			2	4	4
		TOTAL				22	30	30

BSC FOOD SCIENCE
FIRST YEAR: SEMESTER – II

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major/ Minor Food Science	Theory 2	116205	Study of Basic Foodstuffs	2	2	6
			Lab/ Practical-4	116206	Practical Approach to the Basic Foodstuffs	2	4	
	b.	Minor/ Major	Theory 2	-	-	2	2	6
			Lab/ Practical-5	-	-	2	4	
	c.	Generic/ Open Elective	Theory 3	116207	Technology of Fruits and Vegetables Processing	2	2	4
			Theory 4	116208	Technology of Milk and Milk Products	2	2	
	d.	VSC	Lab/ Practical-6	116209	Techniques in Food Science Laboratory	2	4	8
		SEC	Lab/ Practical-7	116210	Basic Skills in Food Processing	2	4	
	e.	AEC - English	Theory			1	1	4
		AEC – MIL	Theory			1	1	
		VEC	Theory			2	2	
	f.	CC	Outdoor			2	4	4
		TOTAL				22	32	32

BSC FOOD SCIENCE
SECOND YEAR: SEMESTER – III

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	g.	Major Food Science	Theory 3	116211	Food Chemistry I	2	2	10
			Theory 4	116212	Food Chemistry II	2	2	
			Lab/ Practical-8	116213	Practical approach to food chemistry	2	4	
		IKS- Major specific	Theory	116214	IKS in Food Science	2	2	
	h.	Minor/	Theory 3	116215	Fundamentals of food chemistry	2	2	6
			Lab/ Practical-9	116216	Laboratory techniques in food chemistry	2	4	
	i.	Generic/ Open Elective	Theory 5	116217	Overview to food and nutrition	2	2	2
	j.	VSC	Lab/ Practical-10	116218	Techniques in food chemistry	2	4	4
	k.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116219	FP/CES in Food Science I	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	32	32

BSC FOOD SCIENCE
SECOND YEAR: SEMESTER – IV

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/ Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major Food Science	Theory 5	116220	Food Biochemistry	2	2	10
			Theory 6	116221	Food Microbiology	2	2	
			Theory 7	116229	Food Quality and Preservation	2	2	
			Lab/ Practical-11	116222	Practical approach to food biology	2	4	
	b.	Minor/	Theory 4	116223	Fundamentals of Food Biology	2	2	6
			Lab/ Practical-12	116224	Simple techniques in food biology	2	4	
	c.	Generic/ Open Elective	Theory 6	116225	Food quality and sensory evaluation	2	2	2
	d.	VSC	Lab/ Practical-13	116226	Techniques in food chemistry	2	4	4
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116228	FP/CES in Food Science II	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	32	32

BSC FOOD SCIENCE
THIRD YEAR: SEMESTER –V

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload(Hrs/Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	l.	Major Food Science	Theory 8	116230	Principles of Food Processing	2	2	16
			Theory 9	116231	Technology of Plant Based Food	2	2	
			Theory 10	116232	Hygiene, Sanitation and Food Safety	2	2	
			Lab/ Practical -15	116233	Laboratory Techniques in Food Processing	2	4	
		Major Elective	Theory 1	116234	Beverages Technology	2	2	
			Lab/ Practical 16	116235	Laboratory Techniques in Beverages	2	4	
			Theory 2	116236	Technology of Honey and Millets	2	2	
			Lab/ Practical 17	116237	Practical Technology of Honey and Millets	2	4	
	m.	Minor/	Theory 5	116238	Quality Control and Preservation	2	2	6
			Lab/ Practical-18	116239	Laboratory Techniques in Spoilage and Preservation	2	4	
	n.	Generic/ O E	-	-	-	-	-	-
	o.	VSC	Lab/ Practical-19	116240	Skills in Food Product Development	2	4	8
		SEC	Lab/ Practical-20	116241	Skill Enhancement in Food Quality	2	4	
	p.	VEC	-	-	-	-	-	0
	f.	FP/ CES	Project	116242	FP/CES in Food Science III	2	4	4
		CC						
		Non Credit	Theory		Foundation of Artificial Intelligence		02	
		TOTAL				22	34+2	34+2

BSC FOOD SCIENCE
THIRD YEAR: SEMESTER – VI

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	q.	Major Food Science	Theory 11	116245	Milk, Confectionaries, and Animal Products	2	2	16
			Theory 12	116246	Food Packaging Food Laws	2	2	
			Theory 13	116247	Food Entrepreneurship and Opportunities	2	2	
			Lab/ Practical -21	116248	Practical Approach to Dairy, Confectionary and Packaging	2	4	
		Major Elective	Theory 3	116249	Fermentation Technology and Functional Foods	2	2	
			Lab/ Practical 22	116250	Laboratory Techniques in Fermentation	2	4	
			Theory 4	116251	Analytical Methods in Food Science	2	2	
			Lab/ Practical 23	116252	Analytical Methods in Food Science Lab	2	4	
	r.	Minor/	Theory 6	116253	Food Processing Hygiene and Quality	2	2	6
			Lab/ Practical-24	116254	Food Processing and Hygiene Laboratory	2	4	
	s.	Generic/ O E	-	-	-	-	-	-
	t.	VSC	Lab/ Practical-25	116255	Skills in Milk Products, Confectionary and packaging	2	4	4
		SEC	-	-		-	-	
	u.	VEC	-	-	-	-	-	0
	f.	OJT	Project	116256	On Job Training	4	8	8
		CC						
		TOTAL				22	34	34

SWAYAM/NPTEL Courses under NEP 2020

S N	Sem	Course Title	Course Code*	Credits**	Institution	Agency	Enrollment Ends	Link to Enroll
1	I	Basics of Food and Nutrition	NOC26_GE100	3	Ramachandra Inst. of HigherEd. and Res. (DU)	NPTEL	17 Aug, 2026	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ge100
2	II	-	-	-	-	-	-	-
3	III	Food Oils and Fats: Chemistry and Technology	NOC26_AG18	4	IIT, Kharagpur	NPTEL	14 Aug, 2026	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ag18
4	IV	Thermal Processing of Foods	NOC26_CH105	4	IIT, Guwahati	NPTEL	27 July, 2026	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ch105
6	V	Fundamentals of Food Process Engineering	NOC26_AG25	4	IIT, Kharagpur	NPTEL	27 July, 2026	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ag25
7	VI	Dairy and Food Process and Products Technology	NOC26_AG23	4	IIT, Kharagpur	NPTEL	27 July, 2026	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ag23

* Course codes may vary according to the year and session of enrollment

** Credits will be awarded as per provisions of the SWAYAM/NPTEL at the time of actual enrollment.

Instructions for Enrollment in SWAYAM/NPTEL Courses under NEP 2020

All students of **B.Sc. with Food Science as Major or Minor** of all semesters are encouraged to enroll in suitable SWAYAM/NPTEL online courses to enhance their academic knowledge, practical skills, and employability.

General Instructions

1. Students may choose any course of their interest listed in table above for specific semester.
2. Before enrollment, students must ensure that they have an active Academic Bank of Credits (ABC) ID. The same ABC ID should be used while registering for the selected SWAYAM/NPTEL course so that earned credits can be deposited in the Academic Bank of Credits.
3. Students should carefully read the course details including duration, eligibility, syllabus, examination schedule, and credit structure before enrolling.
4. Merely enrolling in a course does not make a student eligible for academic credits. Students must: Complete the course requirements, Appear for the proctored examination, and successfully pass the examination as per the norms prescribed by SWAYAM/NPTEL.
5. Credits will be awarded only after successful completion and certification of the course by the concerned agency.

6. Every student must submit the details of the enrolled course to the Department of Food Science immediately after registration.
7. Submission of enrollment details to the Department is mandatory to facilitate record maintenance and compliance with University requirements regarding credit transfer and academic documentation.
8. Students are advised to preserve all course-related documents, including Enrollment confirmation, Course progress records, Examination registration receipt, Score card, Final certificate.
9. Students shall be responsible for timely registration for the examination, payment of examination fees (if applicable), and completion of all course requirements within the stipulated period.
10. The Department shall not be responsible for missed deadlines, incomplete registrations, examination non-appearance, or failure to satisfy the certification requirements of the concerned SWAYAM/NPTEL course.
11. After successful completion of the course, students must submit a copy of the course certificate and score card to the Department of Food Science for further processing and reporting to the University.

Sant Gadge Baba Amravati University, Amravati



Faculty of Science and Technology

Syllabus and Scheme

of

Teaching, Learning, Examination and Evaluation

Under NEP-2020

For

B.Sc. in FOOD SCIENCE

(3 Years UG Course)

Semester I and II

(Implemented w.e.f. Session 2024-25)

Submitted by Board of Studies

Biochemistry including Microbiology and Food Science

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

FIRST YEAR: SEMESTER – I

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	v.	Major/ Minor Food Science	Theory 1	116200	Fundamentals of Food Science	2	2	6
			Lab/ Practical-1	116201	Fundamental techniques in Food Science	2	4	
	w.	Minor/ Major	Theory 1	-	-	2	2	6
			Lab/ Practical-2	-	-	2	4	
	x.	Generic/ Open Elective	Theory 1	116202	Principles of Food Preservation	2	2	4
			Theory 2	116203	Fundamentals of food processing	2	2	
	y.	SEC	Lab/ Practical-3	116204	Skills in determination of properties of food	2	4	4
	z.	AEC - English	Theory			1	1	6
		AEC –MIL	Theory			1	1	
		IKS- Generic	Theory			2	2	
		VEC	Theory			2	2	
	aa.	CC	Outdoor			2	4	4
		TOTAL				22	30	30

Course: B.Sc. I Semester I (Food Science)

116200 Major Theory 1: Fundamentals of Food Science							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	I	116200	Fundamentals of Food Science	2	30	2Hrs	30

Course Objectives	- To acquaint the students with the basic concepts of food and nutrition. - To update the students about features of different types of food groups and functions - To impart knowledge regarding the physical properties of Food - To recall the students regarding the units and dimensions			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize different food groups with their nutritional importance - Categorize the physical properties of food - Distinguish between the fundamental and derived quantities - Differentiate between various types of solutions - Classify acid and bases			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Basics of food and nutrition	Introduction to Food Science, Functions of Food, Food and health; Nutrients and their functions, balance diet, Malnutrition and over-nutrition; Food Groups, Food Pyramid; examples of acidic and basic food; Energy and its unit, Calorific value; Water: properties and types; functions and importance in body and in food processing; Hardness of water, water activity and shelf life of food, bound and unbound water;	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Units and mole concept	Physical quantities and their units in various systems (mass, length, time, volume, area, force, pressure, density, temperature, heat, and specific gravity); Mole concept: Structure of atom; atomic number and weight; molecular and equivalent weight; mole, Concentration in percentage, ppm, molarity, and normality	7 Hrs	7 Marks	

Unit III Dispersions	Dispersions: solutions, suspensions, and colloids, definitions & differences; Colloids: sol, gel, emulsions, foams, and their examples Solutions: types (saturated, unsaturated & supersaturated); Factors affecting solubility; Total soluble solids; brix; Refractometer; Emulsion & emulsifiers, Foams & foaming agents	8 Hrs	8 Marks	
Unit IV Physical properties of food	Introduction to physical properties of food: Diffusion, boiling point, melting point, freezing point, osmosis, reverse osmosis, humidity, vapor pressure, surface tension, viscosity, evaporation; Distillation: types and application; Acids & bases: definitions and examples (organic and inorganic), pH & pH scale	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Chemistry; L. H. Meyer. - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. - Nutrition Science; B. Srilakshmi; New Age International Publisher - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. Explain the concept of balance diet with appropriate examples 2. Differentiate between micro and macro nutrients 3. Explain the physiological functions of food 4. Explain the social functions of food 5. Justify the relation between balance diet and malnutrition 6. Justify the relation between balance diet and over-nutrition 7. Explain boiling point 8. Differentiate between boiling point and melting point 9. classify distillation			

	10. classify units 11. Relate density with mass. 12. Classify dispersions with examples 13. Differentiate between saturated and supersaturated solution 14. Explain Brix 15. Discuss the factors affecting the solubility of the solute 16. justify the importance of emulsifiers in food processing 17. discuss the factors affecting foam formation 18. classify foaming agents 19. Illustrate the role of water as a solvent 20. What is distilled water? State the properties 21. State the importance of hardness of water 22. Establish the relation between water activity and shelf life 23. Define acid and base with examples 24. Explain pH Long Answer Questions 1. Describe nutrition and classify nutrients with examples 2. Justify the importance of each food group with its functions 3. Summarize the functions of food 4. Elaborate the term balance diet and justify its relation with health and nutrition 5. List the important physical properties of food. Relate freezing point and boiling point 6. Explain energy. state the importance of calorific value of food 7. Classify units. Give the units of mass, temperature, volume, in SI, CGS and MKS system 8. Compare suspensions and colloids with examples 9. Classify colloids 10. Discuss solubility. explain the factors influencing solubility 11. Draw a diagram of refractometer. Explain the working 12. Justify the role of emulsifiers and foaming agents in food industries 13. Justify the role of water as a solvent, catalyst, and temperature regulator 14. Compare ground water with mineral and distilled water 15. Elaborate the role of moisture and water activity with the shelf life of food 16. Explain pH, pH scale and its importance 17. Compare the properties of acid and bases with examples 18. Draw a diagram showing the simple structure of atom 19. Calculate the molecular and equivalent weights of glucose
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		

Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)	10 Marks
Total	20 Marks

Course: B.Sc I Semester I (Food Science)

116201 Lab 1: Fundamental techniques in Food Science							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	I	116201	Lab 1: Fundamental techniques in Food Science	2	60	2 Hrs	25+25

Course Objectives	- To train the students in basic techniques in Food Science. - To educate students about food groups and nutrition - To introduce the students to handling and working of common equipments used in the Food Science laboratory. - To educate the students to determine physical properties of food
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food Science lab - Differentiate between various food groups - Determine physical properties of food - Prepare solutions of various concentration

List of Practical

1. Introduction and study of various lab equipments
2. Identification and classification of various food items into the food groups
3. Anthropometric measurements of the students
4. Determination of boiling point
5. Determination of melting point
6. Determination of moisture content
7. Determination of density
8. Determination of specific gravity
9. Preparation of various types of solutions
10. Study of the factors affecting solubility
11. Measurement of brix
12. Preparation of emulsion and foam
13. Determination of hardness of water
14. Determination of pH
15. Determination of acidity and basicity by simple titration
16. preparation of solution of given normality, molarity, percentage, and ppm

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.

- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. I Semester I (Food Science)

116202 Open Elective Theory 1: Principles of Food Preservation							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	I	116202	Principles of Food Preservation	2	30	2Hrs	30

Course Objectives	- To acquaint with principles of different techniques used in processing and preservation of foods. - To make the students aware of the different methods of food processing and preservation - To impart knowledge of the applications of these methods to a particular product			
Course Outcomes	Upon completion of this course successfully, students will be able to - Explain the need of processing and preservation of food - Discuss the similarities and differences between various methods - Categorize different methods of food preservation and processing - Apply the right method to the right food item			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Food spoilage: Definition, causes, factors affecting, types; Food preservation: Introduction, need, principles, methods & classification Food preservation by preservatives: Class I and Class II preservatives with applications	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II	Preservation by low temperature: Refrigeration & freezing: introduction, principle, difference; Types of freezing such as sharp freezing, quick freezing, dehydro-freezing, and freeze drying; Advantages, disadvantages;	7 Hrs	7 Marks	
Unit III	Preservation by high temperature Factors affecting heat resistance of microorganisms Pasteurization: introduction, principle, and types Sterilization: introduction, principle, and types Blanching: introduction, principle, and application Canning: introduction, principle, process, and application Factors affecting the time of	8 Hrs	8 Marks	

	sterilization of cans			
Unit IV	Food preservation by moisture control Drying and dehydration: introduction, principle; Factors affecting drying, treatments before and after drying, Types of drying Food preservation by radiation, concentration, using salt and sugar	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Chemical Changes in Food During Processing by Richardson T - Drying and dehydration of Food by Loeseeke VWH - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Additives by Mahindra S.N - Food and Food Production Encyclopedia by Considmem Douglas - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Outline of Food Technology by Harry W Von - Principles and Practices for the Safe Processing of Foods by Shapton D A - Text Book on Food Storage and Preservation by Khader V - The technology of Food Preservation by Desrosier N			
Model Questions	Short Answer Questions 25. Explain types of food spoilage 26. Discuss the principles of food preservation 27. Justify the need of food preservation 28. differentiate between class I and II preservatives 29. Discuss the role of KMS in food preservation 30. Defend the mechanism of preservation by low temperature 31. Discuss the mechanism of freeze drying 32. Justify the advantages and disadvantages of quick freezing 33. Differentiate between refrigeration and freezing 34. Compare sharp freezing with quick freezing 35. Explain dehydro-freezing 36. List out the factors affecting heat resistance of microorganisms 37. Explain the principle of blanching 38. Explain the principle of Pasteurization 39. Explain the principle of sterilization 40. Explain the principle of canning 41. Enlist the types of pasteurization 42. Establish a relationship between time of sterilization of cans and other factors			

	43. Compare drying with dehydration 44. enlist the factors affecting drying 45. Discuss the types of dryers 46. Discuss the mechanism of preservation by salt or sugar 47. Justify the mechanism of preservation by irradiation Long Answer Questions 20. Describe Convince the need and types of food preservation 21. Discuss the principles of food preservation with examples 22. Explain the factors affecting food spoilage 23. differentiate between class I and II preservatives with examples 24. Discuss the advantages and disadvantages of class II preservatives 25. Compare the methods of food preservation by low temperature 26. Discuss the mechanism of freeze drying with its advantages and disadvantages 27. Differentiate between refrigeration and freezing with examples 28. Compare sharp freezing with quick freezing with its advantages and disadvantages 29. Summarize freeze drying with its advantages and disadvantages 30. Draw a flow diagram to explain the process of canning 31. Draw a flow diagram to explain Pasteurization 32. Establish a relationship between time of sterilization of cans and other factors 33. Compare drying with dehydration. Enlist the types of dryers 34. Enlist the factors affecting drying 35. Summarize irradiation with its mechanism, advantages and disadvantages
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Course: B.Sc. I Semester I (Food Science)

116203 Open Elective Theory 2: Fundamentals of food processing							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	I	116203	Fundamentals of food processing	2	30	2Hrs	30

Course Objectives	- To acquaint with principles of different techniques used in processing of foods. - To make the students aware of the different methods of cooking and food processing - To impart knowledge of the applications of these methods to a particular product			
Course Outcomes	Upon completion of this course successfully, students will be able to - Explain the need of cooking and processing of food - Discuss the similarities and differences between various methods - Categorize different methods of cooking and processing - Apply the right method to the right food item			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Cooking: introduction, Importance & objectives, Preliminary	8 Hrs	8 Marks	Chalk & Board, Power Point

	preparation of cooking Methods of cooking Moist heat methods: boiling, stewing, steaming, pressure cooking, poaching, blanching Dry heat methods: roasting, toasting, grilling, baking, sautéing, frying, braising Baking- theory, equipments, applications, Advantages & disadvantages An overview on Dielectric heating, ohmic heating and infrared heating			Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II	Microwave cooking: introduction, principle, design of microwave oven, safe and unsafe containers, advantages and disadvantages Extrusion cooking: Introduction, definition, principle, classification (hot extruders, cold extruders, single screw, double screw, high shear, low shear), factors affecting extrusion cooking advantages and disadvantages Solar cooking: introduction, principle, design of solar cooker, advantages and disadvantages	7 Hrs	7 Marks	
Unit III	Unit operations in food processing: Cleaning, sorting, grading, peeling, size reduction (in solid and liquid food), mixing, forming, sedimentation, separation (filtration, centrifugation, solvent extraction, distillation, evaporation, etc.) Membrane concentration, types of membranes, reverse osmosis Mass balance, modes of heat transfer (conduction, convection, radiation), heat exchangers, co-current and counter-current heating and cooling, direct and indirect heating	8 Hrs	8 Marks	
Unit IV	Food additives: Introduction, definition, role of additives in food processing, classification food colors (Natural & synthetic), flavoring agents (natural and artificial), Low calorie sweeteners, antioxidants, emulsifiers, stabilizers (gelatin, pectin, agar) Adulteration & adulterants:	7 Hrs	7 Marks	

	Introduction, definition, classification (intentional & unintentional), impact of food adulteration			
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Chemical Changes in Food During Processing by Richardson T • Drying and dehydration of Food by Loeseeke VWH • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Additives by Mahindra S.N • Food and Food Production Encyclopedia by Considmem Douglas • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Outline of Food Technology by Harry W Von • Principles and Practices for the Safe Processing of Foods by Shapton D A • Text Book on Food Storage and Preservation by Khader V • The technology of Food Preservation by Desrosier N			
Model Questions	Short Answer Questions 1. Outline the objectives of cooking 2. Justify the importance of preliminary preparation of cooking 3. Discuss the advantages of moist heat method 4. compare cooking method steaming with pressure cooking 5. Differentiate between toasting and grilling 6. Explain the principle of baking 7. Explain dielectric heating 8. Outline the principle of microwave cooking 9. Discuss the advantages and disadvantages of microwave cooking 10. Outline the principle of extrusion cooking 11. Discuss the advantages and disadvantages of extrusion cooking 12. Differentiate between hot and cold extruders 13. Differentiate between high shear and shear extruders 14. Outline the advantages and disadvantages of solar cooking 15. Justify the importance of size reduction in food processing 16. discuss filtration 17. Explain membrane concentration 18. Discuss the types of membranes 19. Differentiate between conduction and convection 20. Differentiate between conduction and radiation 21. Differentiate between co-current and counter-current heat exchangers 22. Summarize the role of additives in food processing 23. Differentiate between natural and synthetic food colors with examples 24. Summarize the role of low calorie sweeteners			

	Long Answer Questions 1. Defend the role of cooking in nutrition and processing 2. Classify the methods of cooking. Give the advantages and disadvantages 3. Explain the principle of baking. Differentiate between baking and roasting 4. Discuss the preliminary preparations of cooking. Justify their importance 5. Explain the advantages and disadvantages of dielectric and ohmic heating 6. Draw a diagram of microwave oven. explain each part with its working 7. Clarify the importance of microwave cooking with its mechanism and advantages 8. Classify extruders with their applications 9. Discuss the principle of extrusion cooking with the factors affecting 10. Draw a diagram of solar cooker showing its mechanism 11. State the importance of unit operations and its role in food processing 12. Compare the methods of separation with examples 13. Define heat transfer. Explain the modes of heat transfer with examples 14. Classify adulterants 15. Justify the importance of additives. Give the classification
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Course: B.Sc. I Semester I (Food Science)

116204 SEC Lab/Practical 3 : Skills in determination of physical properties of food							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
4.5	I	116204	Skills in determination of properties of food	2	60	2Hrs	50

Course Objectives • To train the students to identify the food items of various groups • To impart the skill of determining various physical properties of food • To make students eligible to prepare different types of solutions • To educate the students to apply the skills to prepare the emulsions and foams
COs: Upon completion of this course successfully, students will be able to • Do focus on all the above objectives • Calculate nutritional value of food • Distinguish between the various properties of food • Expertise in the preparation of solutions • Apply the knowledge of distillation for separation of two materials
List of practical 1. Use of various lab equipments 2. Calculation of nutritional values of the food 3. Standardization of the solutions 4. Numerical problems on the inter-conversion of units in various systems 5. Calculation of Molarity and Normality of the solution 6. Preparation of solutions for different experiments

7. Determination of boiling points of various liquid food
8. Use of various measuring apparatus and equipments
9. Study of solubility of sugar and salt
10. Measurement of brix of various products
11. Study the relationship of hardness of water with solubility and boiling point
12. Separation of salt from water by distillation
13. Preparation of distilled water
14. Determine moisture contents of various food items
15. Comparison of the properties of emulsions/ foams

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

FIRST YEAR: SEMESTER – II

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	g.	Major/ Minor Food Science	Theory 2	116205	Study of Basic Foodstuffs	2	2	6
			Lab/ Practical-4	116206	Practical Approach to the Basic Foodstuffs	2	4	
	h.	Minor/ Major	Theory 2	-	-	2	2	6
			Lab/ Practical-5	-	-	2	4	
	i.	Generic/ Open Elective	Theory 3	116207	Technology of Fruits and Vegetables Processing	2	2	4
			Theory 4	116208	Technology of Milk and Milk Products	2	2	
	j.	VSC	Lab/ Practical-6	116209	Techniques in Food Science Laboratory	2	4	8
		SEC	Lab/ Practical-7	116210	Basic Skills in Food Processing	2	4	
	k.	AEC - English	Theory			1	1	4
		AEC – MIL	Theory			1	1	
		VEC	Theory			2	2	
	l.	CC	Outdoor			2	4	4
		TOTAL				22	32	32

Course: B.Sc. I Semester II (Food Science)

Programme: B.Sc. (Food Science)

116205 Theory 2: Study of Basic Foodstuffs							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	II	116205	Study of Basic Foodstuffs	2	30	2Hrs	30

Course Objectives	- To know the need and importance of study of basic food commodities - To update the students about features of different types of foodstuffs and their functions - To impart knowledge regarding the composition and classification of different food - To recall the students regarding the commercial importance of foodstuffs			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize various grains according to the sources - Explain the importance of fruits and vegetables in nutrition - Justify the importance of protein rich foods like pulses, oil seeds, nuts, etc. - Discuss the various milk and other animal food sources - Justify the nutritional and commercial role of eggs and poultry			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Grains and pulses	Grains, cereals, pseudo cereals and millets: classification, composition, structure, nutritional and commercial importance; Pulses and legumes: classification, composition, nutritional and commercial importance	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Fats/oils, oil seeds, and nuts	Fats and oils: classification, composition, nutritional and commercial importance; Various products such as margarine, mayonnaise, hydrogenated fat, etc.; Oil seeds: classification, composition, nutritional and commercial importance Nuts: classification, composition, nutritional and commercial importance	7 Hrs	7 Marks	
Unit III Animal Products	Milk and milk products: classification, composition, nutritional and commercial importance; An overview of types of market milk (probiotic milk, lactose free milk, fortified milk) and milk products; Eggs: classification, composition, nutritional and commercial importance;	8 Hrs	8 Marks	

	Structure of hen's egg; Quality of egg, difference between broiler and layers. Meat and fish: classification, composition, nutritional and commercial importance			
Unit IV Fruits, Vegetables and Spices	Fruits and Vegetables: Classification with examples, general composition; names and sources of pigments; Dietary fibres; Commercial and nutritional importance; Overview on the products of fruits and vegetables Spices and condiments: classification, composition, nutritional and commercial importance	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Chemistry; L. H. Meyer. - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. - Nutrition Science; B. Srilakshmi; New Age International Publisher - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions - Differentiate between fats and oils - Summarize the general composition of oil seeds - Convince the importance of fats and oils in health and food processing - Draw the structure of typical cereal grain - Illustrate the importance of each part of the grain - Explain the nutritional importance of grains - Explain the nutritional importance of fats and oils - Classify nuts with examples - Convince the importance of nuts in nutrition - Justify the importance of spices - Classify the spices with examples - Illustrate the difference between fruits and vegetables - Explain the generalized composition of fruits and vegetables - Discuss the nutritional importance of fruits and vegetables - Justify the importance of processing in milk. Explain pasteurization of milk - List of various types of milks and milk products in market - Elaborate the nutritional and commercial importance of milk - Draw a typical carcass			

	19. Categorize the meat on the basis of its color and source 20. Classify the fishes 21. Discuss the nutritional importance of fish 22. Differentiate between broiler and layers 23. Relate the properties of eggs with its freshness 24. Discuss the functional properties of eggs 25. Summarize the characteristics of fresh fish 26. Illustrate the commercial importance of fish Long Answer Questions 1. Draw and explain the structure of wheat grain showing important parts 2. Explain the composition, nutritional and commercial importance of oil seeds 3. Classify spices on the basis of their use and give the importance 4. Explain the composition, nutritional and commercial importance of oil seeds 5. Classify fruits on the basis of its properties and nutrition 6. Draw the flow diagram of milk processing 7. Discuss the post harvest changes in the fruits and vegetables 8. Discuss the commercial and nutritional importance of fruits and vegetables in detail 9. Summarize the importance of dietary fibers with examples 10. Classify fish and give their processing 11. Draw a diagram of typical egg and explain the parts 12. Draw a structure of carcass and discuss its cuts
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. I Semester II (Food Science)

116206 Lab 4: Practical Approach to the Basic Foodstuffs							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	II	116206	Practical Approach to the Basic Foodstuffs	2	60	2 Hrs	25+25

Course Objectives	- To train the students in identifying basic food commodities - To educate students about the basic testing of foodstuffs - To determine the properties of food
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	To educate the students to perform the primary processing of food items
Course Outcomes	After completion of this course students will be able to - Do focus on all the above objectives - Perform the testing of food commodities - Determine properties of food items - Identify the quality of food items - Perform primary processing of foodstuffs
List of Practical - Determination of acid/ saponification value of the given oil sample - Identification of various oil seeds - Identification and classification of different grains - Determination of 1000 grain weight of the given cereal sample - Gelatinization of the starch - Estimation of gluten from wheat flour - Identification of sources of various commercial food products - Identification of various spices and nuts - Study of juice extraction from fruits - Study of blanching of fruits and vegetables - Study and identification of various pigments in fruits and vegetables - Study of method of coagulation of protein - Study of method of fermentation of milk - Quality assessment of milk - Study of quality of eggs	
References - Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011 - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna. - Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016 - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad - UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004	

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. I Semester II (Food Science)

116207 Open Elective Theory 3: Technology of Fruits and Vegetables Processing							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	II	116211	Technology of Fruits and Vegetables Processing	2	30	2Hrs	30

Course Objectives	- To impart knowledge of different methods of fruits and vegetable processing - To acquaint with principles of different techniques used in processing and preservation of fruits and vegetables.			
Course Outcomes	Upon completion of this course successfully, students will be able to - Adapt conventional practices and modern technology for preservation of fruits and vegetables - Gain expertise on the preservation methods of surplus fruits and vegetables at home scale level - Select the appropriate method for the preservation of fruits and vegetables - Justify the need and importance of processing and preservation			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Introduction, Importance of fruits and vegetable, need of preservation, Reasons of spoilage, Method of preservation Pickles, chutneys and sauces: Processing, Types, Causes of spoilage Dehydration of fruits and vegetables: Sun drying & mechanical dehydration, packing and storage	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II	Canning and bottling of fruits and vegetables: Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods	7 Hrs	7 Marks	
Unit III	Fruits beverages: Introduction, Processing of fruit juices (selection of fruits, juice extraction, de-aeration, straining, filtration and clarification) Preservation of fruit juices: pasteurization, preservation by	8 Hrs	8 Marks	

	sugars and chemical, freezing, drying, tetra-packing, carbonation, processing of squashes, cordials, nectors, concentrates and powder			
Unit IV	Jams and jellies: Introduction Jam: Constituents, selection of fruits, processing & technology Jelly: Essential constituents(Role of pectin, ratio), Theory and processing of jelly, defects in jelly Tomato products: Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup.	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Chemical Changes in Food During Processing by Richardson T - Commercial Unit and Vegetable Products by W B Crusess. W.V. Special Indian Edition, Pub: Agrobios India - Drying and dehydration of Food by Loeseeke VWH - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Additives by Mahindra S.N - Food and Food Production Encyclopedia by Considmem Douglas - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Outline of Food Technology by Harry W Von - Preservation of fruits & Vegetables by Girdharilal, Siddappaa, G.S and Tandon, G.L., ICAR, New Delhi, 1998Principles and Practices for the Safe Processing of Foods by Shapton D A - Text Book on Food Storage and Preservation by Khader V - The technology of Food Preservation by Desrosier N			
Model Questions	Short Answer Questions 1. Explain the need for the preservation of fruits and vegetables 2. Discuss the reasons of spoilage of fruits 3. Discuss the reasons of spoilage of vegetables 4. Explain the mechanism of preservation of vegetables by pickeling 5. Categorize the causes of spoilage 6. Discuss the steps in the dehydration of F & V 7. State the factors affecting the canning time 8. Explain the requirements of properties of containers for canning 9. Enlist the types of juicers used for fruit juice production 10. Justify the need of deaeration of juices			

	11. Explain pasteurization of juices 12. Discuss the step straining in the fruit juice processing 13. Discuss the preservatives used for the preservation of fruit juices 14. Explain carbonation with its importance 15. Explain tetra packing of juices 16. Enlist the ingredients required for jam preparation 17. Explain the theory of gel formation in jelly 18. Justify the need of selection of fruits in jam/ jelly making 19. Glorify the role of pectin in jelly formation 20. Differentiate between tomato puree and paste 21. Differentiate between tomato sauce and ketchup Long Answer Questions 1. State the importance of fruits and vegetables. Justify the need of preservation. 2. List out the methods of preservation of fruits and vegetables. Discuss any one. 3. Justify the importance of pickling. Draw a flow diagram of mango pickle preparation 4. Explain the preservation of cucumber by pickling with flow diagram 5. elaborate the method of dehydration of any F/V with flow diagram 6. Explain the working of mechanical dryers with detailing of each step 7. Draw a flow diagram showing each step in canning of fruits and vegetables 8. Explain the role of syrups and brines in the canning with examples 9. Details the factors affecting the canning process 10. Outline each step of canning 11. Classify fruit beverages 12. Explain fruit juice processing with flow diagram 13. Justify the need of preservation of fruit juices with examples 14. Explain the drying of fruit juices with flow diagram 15. Explain the preparation of tomato ketchup with flow diagram 16. Explain the preparation of jam with flow diagram
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Course: B.Sc. I Semester II (Food Science)

116208 Open Elective Theory 4: Technology of Milk and Milk Products							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
4.5	II	116208	Technology of Milk and Milk Products	2	30	2Hrs	30

Course Objectives	• To know the need and importance of dairy industry • To know the compositional and technological aspects of milk and processed milk products. • To develop young entrepreneurs for self-employment through dairy technology and associated activities
Course Outcomes	Upon completion of this course successfully, students will be able to • Understand the importance of dairy industry and the basic technology needed • Explain the need of milk and milk product processing

	- Start up a small enterprise related to milk and milk product - Apply various methods to milk and milk product processing			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Importance of dairy development in India; Collection of milk: Platform testing; Physicochemical properties of milk: Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, etc.; composition, constituents and nutritional Importance; Effect of heat, acid, enzymes, phenolic compounds, salts, microorganisms, etc. Preservatives, Neutralizers and Adulterants in Milk and their Detection	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II	Equipment used in dairy industry: Processing, transport, mixing, heating, etc. Cleaning and maintenance of equipments Refrigeration System: Basic Principles and Components of Refrigeration System Different Cooling Systems for Milk and Milk Products.	7 Hrs	7 Marks	
Unit III	Processing of milk: Clarification, separation, bacto-fugation, homogenization, Pasteurization and Ultra-high-temperature processing; Packaging: materials process and machinery. Different types of fluid milk produced commercially, Storage and Distribution Systems	8 Hrs	8 Marks	
Unit IV	Processing of milk products: Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, channa, paneer, cheese, etc. Defects during Manufacturing and Storage	7 Hrs	7 Marks	
References	Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The			

	• A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication Bangalore Printing and Publishing Co. Ltd, Bangalore. 2006 • Applied microbiology Dr. Parihar Pramila , New delhi Swastik Publication • Chemical Changes in Food During Processing by Richardson T • Dairy Microbiology by Parihar & Parihar • Encyclopedia of Foods– A Guide to Healthy Nutrition,Academic Press – An Imprint of Elsevier, San Diego, California • Food Additives by Mahindra S.N • Food and Dairy Microbiology Dr Rao M K New Delhi Mangalam publication • Food and Food Production Encyclopedia by Considmem Douglas • Food Facts & Principle, Shakuntala Manay, M. Shadaksharaswamy;New Age International (p) Limited. • Food Microbiology by Adam Moss • Food Microbiology by W.C. Fraizer, Tata Macgraw Hill Publication • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Industrial Microbiology, Patel A H, Mumbai Mcmillan, Mumbai • Modern Food Microbiology Jay J M , New Delhi CBS Publication • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Outline of Food Technology by Harry W Von • Principles and Practices for the Safe Processing of Foods by Shapton D A • Text book of Microbiology Purohit S, Jodhpur Arobios India • Text Book on Food Storage and Preservation by Khader V • The technology of Food Preservation by Desrosier N
Model Questions	Short Answer Questions 1. Outline the importance of dairy industry in India 2. List out the types of milks 3. List out the dairy products in India with their importance 4. Discuss the physical properties of milk 5. Define freezing, boiling point, and pH of milk 6. Discuss pasteurization of milk 7. Discuss the adulteration in milk 8. List out the equipments used in dairy industry 9. Explain the cleaning agents used in dairy industry 10. outline the principle and components in milk refrigeration 11. Discuss the different cooling systems for milk 12. Explain clarification of milk 13. Discuss the types of fluid milk produced commercially 14. Give the importance of storage of milk 15. Discuss milk distribution system 16. Draw a flow chart for ice-cream preparation 17. Draw a flow chart of yougurt manufacturing 18. Draw a flow chart of cheese manufacturing 19. Draw a flow chart of ghee manufacturing 20. Draw a flow chart of butter manufacturing Long Answer Questions 1. Discuss the dairy industries in detail

	2. Explain the platform testing of milk 3. Discuss the physical properties of milk in detail 4. Discuss the effect of heat, acid, and enzymes on milk 5. Explain the common adulteration in milk. How it is detected? 6. Discuss the working of cream separator 7. Discuss the working of homogenizer 8. Discuss the principles and Components of Refrigeration System in milk 9. Overview the cooling systems for milk and milk products 10. Overview the ultra-high temperature processing of milk 11. Discuss the storage and distribution system of milk 12. Enlist the different types of fluid milks. Explain any one with flow diagram 13. Illustrate the manufacturing process of flavored milk with flow diagram 14. Illustrate the manufacturing process of cottage cheese with flow diagram 15. Illustrate the manufacturing process of ice-cream with flow diagram 16. Illustrate the manufacturing process of paneer with flow diagram
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Course: B.Sc. I Semester II (Food Science)

Programme: B.Sc. (Food Science)

116209 VSC Lab/Practical 6 : Techniques in Food Science Laboratory							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
4.5	II	116209	Techniques in Food Science Laboratory	2	60	2Hrs	50

Course Objectives

- To train the students in basic skills of using the equipment in the Food Science laboratory
- To impart the skill of application of various preliminary operations for the basic processing
- To educate the students about the applications of basic concepts in diet planning
- To train the students to apply the knowledge to compare the properties of food
- To impart the skill of use of a Brix meter to determine the total soluble solids

COs: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Identify the oils by their properties
- Apply methods like blanching, fermentation, etc. for food processing
- Determine and compare the physical properties of food
- Handle the pH meter and Brix meter

List of practical

1. Study of anthropometric measurements of the students
2. Planning of balance diet
3. Identification of edible oil using simple quality parameters
4. Comparison of gelatinization of the various starches
5. Comparison of various spice blends (masalas)
6. Determination of juice yield from different fruits
7. Comparison of blanching of different fruits and vegetables samples
8. Comparison of coagulation of protein by heat, acid and enzyme
9. Performing gelatinization of the starch
10. Study of fermentation rate of milk at different temperatures
11. Comparison of cooking quality of different rice varieties
12. Comparison of hydration capacity of pulses
13. Determination of water absorption capacity of wheat flour
14. Comparative study of different market milk samples

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad

Course: B.Sc. I Semester II (Food Science)

116210 SEC Lab/Practical 7 : Basic Skills in Food Processing

Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
4.5	II	116210	Basic Skills in Food Processing	2	60	2Hrs	50

Course Objectives

- To train the students in basic skills of using the equipment in the Food Science laboratory
- To impart the skill of application of various preliminary operations for the basic processing
- To educate the students about the applications of basic concepts in diet planning
- To train the students to apply the knowledge to compare the properties of food
- To impart the skill of use of a Brix meter to determine the total soluble solids

Cos: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Identify the oils by their properties
- Apply methods like blanching, fermentation, etc. for food processing
- Determine and compare the physical properties of food
- Handle the pH meter and Brix meter

List of practical

1. Preparation of reagents for the determination of acid/ saponification value
2. Comparison of densities of different food samples
3. Determination and comparison of acidity of fruit juices and milk
4. Comparison of gluten in different flour samples
5. Determination and comparison of 1000-grain weight of cereals and millets
6. Carry out blanching of different fruits and vegetables
7. Carry out fermentation of various milk samples
8. Comparison of different milk samples according to the quality parameter
9. Whipping of egg
10. Preparation of various spices
11. Study of juice extraction yield of various fruits
12. Comparison of specific gravity of different liquid food
13. Preparation of a simple quality evaluation report of a selected food sample

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for VSC/ SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Sant Gadge Baba Amravati University, Amravati



Faculty of Science and Technology

Syllabus and Scheme

of

Teaching, Learning, Examination and Evaluation

Under NEP-2020

For

B.Sc. in FOOD SCIENCE

(3 Years UG Course)

Semester III and IV

(Implemented w.e.f. Session 2025-26)

(Revised from Session 2026-27)

Submitted by Board of Studies

Biochemistry including Microbiology and Food Science

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

SECOND YEAR: SEMESTER – III

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/ Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	bb.	Major Food Science	Theory 3	116211	Food Chemistry I	2	2	10
			Theory 4	116212	Food Chemistry II	2	2	
			Lab/ Practical-8	116213	Practical approach to food chemistry	2	4	
		IKS- Major specific	Theory	116214	IKS in Food Science	2	2	6
	cc.	Minor/	Theory 3	116215	Fundamentals of food chemistry	2	2	
			Lab/ Practical-9	116216	Laboratory techniques in food chemistry	2	4	
	dd.	Generic/ Open Elective	Theory 5	116217	Overview to food and nutrition	2	2	2
	ee.	VSC	Lab/ Practical-10	116218	Techniques in food chemistry	2	4	4
	ff.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116219	FP/CES in Food Science I	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	32	32

Course: B.Sc II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116211 Major Theory 3: Food Chemistry I							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116211	Food Chemistry I	2	30	2Hrs	30

Course Objectives	- To acquaint the students with the basic concepts of food chemistry. - To update the students about chemical composition of food and nutrients - To impart knowledge regarding the chemical properties of Food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize carbohydrates in different categories - Imagine the structure of carbohydrates and protein - Distinguish between glycosidic and peptide bonds - Classify protein, and amino acids - Identify food sources of carbohydrates and proteins			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction and importance of Food chemistry Carbohydrates: Introduction, definition, food sources, Functions, & classification with examples Structure of glucose, fructose, galactose, Structure of disaccharides (sucrose, maltose, lactose) Importance of glycosidic bond Sugars & non-sugars difference, reactions of reducing groups	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Polysaccharides	Structure of polysaccharides: starch, glycogen, cellulose & hemicelluloses, pectic substances Physical & chemical properties of polysaccharides (action of alkalies, acids, oxidation, reduction, etc.) browning reaction; Dextrinization, retrogradation, gelatinization of starch Food sources	7 Hrs	7 Marks	
Unit III Proteins	Proteins: Introduction, definition, functions (static & dynamic), composition, food sources Classification- on the basis of functions, properties (simple, conjugated, derived), nutritional value (complete, incomplete, partially incomplete) Structure of proteins: primary,	8 Hrs	8 Marks	

	secondary, tertiary & Quaternary. Denaturation and coagulation of proteins			
Unit IV Amino acids	Physical and functional properties of proteins, proteins found in common foods (milk, meat, eggs, wheat, soy etc) and their importance Amino acids: introduction, definition, composition, general structure Essential & non essential amino acid, food sources of essential amino acids	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Chemistry; L. H. Meyer. - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. - Nutrition Science; B. Srilakshmi; New Age International Publisher - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. Define carbohydrate 2. What is reducing sugar? 3. What is non-reducing sugar? 4. What is total sugar? 5. Give some examples of reducing sugar 6. Give example of non-reducing sugar 7. Give the linear structure of glucose 8. Give the linear structure of fructose 9. What is starch? 10. What is cellulose? 11. Define polysaccharides 12. What are the types of browning reaction? 13. Define protein 14. Name the bond involved in protein 15. What are amino acids? 16. Give any two examples of amino acids 17. What are complete protein Long Answer Questions			

	1. Differentiate between glucose and fructose 2. Give the ring structure of glucose and fructose 3. Give the structure of sucrose. Why it is a non-reducing sugar? 4. Give the classification of monosaccharides 5. Draw the structure of starch 6. Differentiate between starch and glycogen 7. Compare sugars and non-sugars 8. Classify carbohydrates 9. Classify polysaccharides 10. Classify amino acids 11. Classify protein according to their functions 12. Classify protein according to their structure 13. Differentiate between essential and non-essential amino acids 14. Explain the browning reaction with example 15. Compare protein and amino acids 16. State the importance of protein 17. What is denaturation of protein? Explain with example
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Course: B.Sc II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116212 Major Theory 4: Food Chemistry II							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116212	Food Chemistry II	2	30	2Hrs	30

Course Objectives	• To acquaint the students with the basic concepts of food chemistry. • To update the students about chemical composition of food and nutrients • To impart knowledge regarding the chemical properties of Food			
Course Outcomes	Upon completion of this course successfully, students will be able to • Categorize lipids on the basis of structure • Categorize antioxidants, phytochemicals and pigments • Distinguish between the above said food constituents • State the importance of lipids, vitamins, minerals, and other biomolecules • Classify vitamins and minerals			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Lipids	Lipids: Introduction, definition, composition, sources Classification: simple, compound, derived and miscellaneous lipids & their examples. Structure of lipids Physical properties of fats & oils, iodine number and saponification number,	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments,

	difference between fats & oils, deterioration (rancidity)			surprise quizzes, question and answering sessions
Unit II Fatty acids	Fatty acids: Introduction, classification (essential, non essential, saturated, unsaturated, mono-saturated, poly-unsaturated) Structure, properties, Functions, importance, and food sources of fatty acids (omega 3,6,9 fatty acids) important physical and chemical properties	7 Hrs	7 Marks	
Unit III Vitamins and minerals	Vitamins: Introduction & classification of vitamins; Functions, sources and deficiency symptoms of vitamins Minerals: Introduction & classification of minerals; Functions, sources and deficiency symptoms of minerals iron, calcium, phosphorous, sodium, potassium, iodine & magnesium	8 Hrs	8 Marks	
Unit IV Antioxidants, phytochemicals and Pigments	Introduction to Antioxidants, phytochemicals, and pigments. Definition, classification, types, functions and food sources of Antioxidants, phytochemicals, and pigments	7 Hrs	7 Marks	
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. What are triglycerides? 2. What are oils? 3. State saturated fatty acids 4. Give the examples of saturated fatty acids 5. State unsaturated fatty acids			

	6. Give the examples of unsaturated fatty acids 7. Define pigments 8. Define antioxidants 9. Define phytochemicals 10. Give examples of pigments 11. Give examples of antioxidants 12. Give examples of phytochemicals 13. State the fat soluble vitamins 14. State the water soluble vitamins 15. Give the examples of macronutrients 16. Define vitamins 17. Define minerals 18. What are micro minerals Long Answer Questions 1. State the functions of lipids 2. Classify lipids with examples 3. Compare fats and oils 4. Give the classification of fatty acids 5. What are omega three fatty acids? Give its food sources 6. State the importance of antioxidants in nutrition 7. State the importance of pigments in nutrition 8. State the importance of phytochemicals in nutrition 9. Classify phytochemicals with examples 10. Compare fat and water soluble vitamins 11. Give the function, deficiency symptoms, and food sources of vitamin A 12. Give the function, deficiency symptoms, and food sources of vitamin C 13. Give the function, deficiency symptoms, and food sources of any two minerals 14. Give the function, deficiency symptoms, and food sources of calcium 15. Give the function, deficiency symptoms, and food sources of fat soluble vitamins 16. Differentiate between micro and macro minerals 17. Give the food sources of antioxidants, phytochemicals and pigments
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc II Semester III (Food Science)

116213 Major Lab 8: Practical approach to food chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116213	Lab 8: Practical approach to food chemistry	2	60	2 Hrs	25+25

Course Objectives	- To train the students in basic techniques in Food Chemistry. - To educate students about constituents of food and their chemistry - To introduce the students to handling and working of common equipments used in the Food Science laboratory.
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food Science laboratory - Estimate the various constituents in food sample - Determine chemical properties of food - Prepare solutions for various experiments

List of Practical

1. Preparation of solutions
2. Standardization of solutions
3. Study of simple titration
4. Qualitative analysis of carbohydrates
5. Qualitative analysis of amino acids
6. Estimation of reducing sugar
7. Estimation of non-reducing sugar
8. Separation of amino acids by paper chromatography
9. Estimation of vitamin C in given sample
10. Estimation of calcium in given food sample
11. Determination of saponification value of given oil sample
12. Determination of acid value of given oil sample
13. Qualitative analysis of phytochemicals
14. Estimation of calcium

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asian Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116214 IKS Major Specific Theory: IKS in Food Science							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5	III	116214	IKS in Food Science	2	30	2Hrs	30

Course Objectives	- To understand the indigenous knowledge of food science - To explore ancient food practices and their relevance with modern food science - To impart knowledge regarding classification of food from Indian ancient history - To study the basic concepts of Ayurved and food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize food on the basis of Ayurvedic knowledge - Describe the types of prakruti and food - Justify the importance of Indian indigenous knowledge and its current relevance - Discuss the classification of food			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Foundation of IKS	Introduction to the core principles of IKS. The concept and classification of "Ahara" (food) in ancient philosophy (Vedic & Ayurvedic, Jain, and buddhist) Understanding food combinations (Viruddha Ahara) and their effects. Dinacharya (daily regimen) and Rutucharya (seasonal regimen) in relation to diet	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II	The Tridosha theory (Vata, Pitta,	7 Hrs	7 Marks	

Principles of Food and Digestion	Kapha) and its relation to food. "Agni" (digestive fire) and its importance in nutrient assimilation. Understanding the concept of "Pathya" (wholesome) and "Apathya" (unwholesome) foods. The importance of fasting (Upvasa) and its spiritual and physical benefits.			
Unit III Jain and Buddhist Dietary Principles	The concept of "Sattvik" diet in Jainism and its relation to Ahimsa. Detail of permitted and prohibited foods in Jain diet. Understanding the rationale behind avoiding root vegetables. Understanding the connection between diet and the "three poisons" in Buddhism (greed, hatred, delusion). The concept of "middle way" in dietary habits. Variations in dietary practices across different Buddhist traditions (Theravada, Mahayana, Vajrayana). The significance of vegetarianism and veganism in Buddhist practice.	8 Hrs	8 Marks	
Unit IV Traditional Food Processing	Exploration of the nutritional properties of native Indian grains, pulses, fruits, and vegetables. The role of spices and herbs in enhancing nutritional value and promoting health. Ancient Indian methods of food preservation (e.g., fermentation, drying, pickling). Traditional cooking techniques and their nutritional impact. The use of traditional pottery and cooking vessels.	7 Hrs	7 Marks	
References	- Hindu Dietary Practice: Vedic Guidance for Feeding the Body , Mind, and Soul , Kiran Atma and Jai Krishna ponnappan, Paantheon , 2023 - Traditiona and Ayurvedic Foods of Indian Origin , Science Direct , 2015 - Monks Cookbook, Himalayan Academy , Himalayan Academy 1997 - Encyclopedia of Hindusim , Kapil Kapoor, Rupa & co, 2012 - Tridosha theory of Ayurveda: Role of Vata, Pitta, kapha in maintenance of Health , Dr. Kavita Vyas , Independently , 2020. - Tridosha made Easy: The Basic Ayurvedic Principle , Dr. Vaidya Vasant patil , 2019 - The spiritual Benefits of Fasting: a Practical handbook, Shanta Durga, Independently, 2023. - The Mind of Clover: Essays in Zen Buddhist Ethics, Robert Aitken, North			

	Point Press, 1984. • Buddhist Vegetarianism: A Noble way of Living , Venerable Master Hsing Yun , Buddha's Light Publishing , 2010. • The Surangama Sutra, Buddhist Text Translation Society , Buddhist Text Translation Society, 2009. • Buddhist Ethics: A Very short Introduction, Damien Keown, Oxford University Press , 2005. • Ahimsa: Buddhism and the Vegetarian Ideal, Bodo Balsys, Motilal Banarsidass, 2004 • The Complete Book on Fruits, Vegetables and Food Processing, NIIR Board of Consultants 7 Engineers, National Institute of Industrial Research, 2006. • Indian Foods: AAPI's guide to Nutrition, Health, and Diabetes, AAPI (American Association of Physicians of Indian Origin), AAPI , 2011. • Traditional Indian Functional Foods, Ramesh V. Bhat and K. V. Raghuram, NIN, India, 1995. • Tiffin: 500 Authentic Recipes Celebrating India's Regional Cuisine, Sonal Ved, Roli Books, 2018.
Model Questions	Short Answer Questions 1. Define Ahara as per Jain philosophy 2. Define Ahara as per Hindu philosophy 3. What is Viruddha Ahara? 4. What is Rutucharya? 5. Name the Tridosha 6. What is Kapha? 7. Define Pathya 8. Define Upavas 9. Define Sattvik aahar 10. According to Buddhism what are the three poisons? 11. Which philosophy suggest the middle way in dietary habits? 12. What is Mahayana? 13. Name some traditional spices 14. Name the ancient methods of food preservation 15. Name the Indian native grains 16. List the traditional cooking techniques Long Answer Questions 1. Elaborate the concept of Ahara in Jainism 2. Elaborate the concept of Ahara in Buddhism 3. state the effects of Viruddha Ahara 4. Explain Dinacharya and its importance 5. Give the core principles of IKS 6. Explain the Tridosh theory in brief 7. Describe the importance of Agni in digestion 8. Differentiate between Pathya and Apathya 9. Elaborate the physical benefits of Upavas 10. Elaborate the spiritual and mental benefits of Upavas 11. Describe the Sattvik Ahara in brief with examples 12. Justify the importance of avoiding root vegetables 13. Explain the concept of three poisons in Buddhism

	14. Explain the dietary practices of different Buddhist tradition 15. Describe the significance of vegetarianism in Buddhism 16. Give the nutritional properties of millets 17. Describe the ancient methods of food preservation in brief 18. Explain the benefits of copper and iron vessel in cooking 19. Describe the importance of Ghee
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116215 Minor Theory 3: Fundamentals of Food Chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116215	Fundamentals of Food Chemistry	2	30	2Hrs	30

Course Objectives	- To know the need and importance of study of food chemistry - To update the students about chemistry of different types of foodstuffs - To impart knowledge regarding the structure of different food constituents - To recall the students regarding the chemical reactions of food constituents			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize various constituents of food - Explain the importance chemistry of each constituent such as carbohydrate, protein, lipids, vitamins and minerals - Justify the importance of chemical reactions by the various constituents of food. - Discuss the structure of various food constituents - Justify the nutritional and commercial role of these constituents			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction to Food chemistry Carbohydrates: Introduction, functions, and classification with examples Structure of glucose and fructose Sugars & non-sugars difference Browning reaction, dextrinization, retrogradation, and gelatinization of starch	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Protein and amino acid	Proteins: Introduction, functions, and food sources Classification- on the basis of functions, properties, and nutritional value Primary, secondary, tertiary & quaternary structure of proteins Amino acids: introduction, structure, and composition; Essential & non essential amino acid	7 Hrs	7 Marks	
Unit III Lipids	Lipids: Introduction, functions, and food sources Classification and Structure Physical properties and difference between of fats & oils Fatty acids: Introduction and classification (essential, non essential, saturated, unsaturated, mono-saturated,	8 Hrs	8 Marks	

	poly-unsaturated)			
Unit IV Vitamins and minerals	Vitamins: definition, introduction & classification of vitamins Functions, sources and deficiency symptoms of vitamins Minerals: definition, introduction & classification of minerals Functions, sources and deficiency symptoms of minerals iron, calcium, phosphorous, sodium, potassium, iodine & magnesium	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Chemistry; L. H. Meyer. - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science & Nutrition; Sunetra Roday; Oxford University Press. - Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited - Food Science; N. N. Potter. - Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. - Nutrition Science; B. Srilakshmi; New Age International Publisher - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.			
Model Questions	Short Answer Questions 1. Define carbohydrate 2. What is reducing sugar? 3. What is non-reducing sugar? 4. What is total sugar? 5. Give some examples of reducing sugar 6. Give example of non-reducing sugar 7. Give the linear structure of glucose 8. Give the linear structure of fructose 9. What is starch? 10. Define polysaccharides 11. Define protein 12. Name the bond involved in protein 13. What are amino acids? 14. Give any two examples of amino acids 15. What are complete protein 16. What are triglycerides? 17. What are oils? 18. State saturated fatty acids 19. State unsaturated fatty acids 20. Give the examples of unsaturated fatty acids 21. State the fat soluble vitamins			

	22. State the water soluble vitamins 23. Give the examples of macronutrients 24. Define vitamins 25. Define minerals 26. What are micro minerals? Long Answer Questions 1. Differentiate between glucose and fructose 2. Give the structure of sucrose. Why it is a non-reducing sugar? 3. Give the classification of carbohydrates 4. Differentiate between starch and glycogen 5. Compare sugars and non-sugars 6. Classify polysaccharides 7. Classify amino acids 8. Classify protein according to their functions 9. Classify protein according to their structure 10. Differentiate between essential and non-essential amino acids 11. Explain the browning reaction with example 12. State the importance of protein 13. What is denaturation of protein? Explain with example 14. State the functions of lipids 15. Classify lipids with examples 16. Compare fats and oils 17. Give the classification of fatty acids 18. Give the function, deficiency symptoms, and food sources of vitamin C 19. Give the function, deficiency symptoms, and food sources of any two minerals 20. Give the function, deficiency symptoms, and food sources of calcium 21. Differentiate between micro and macro minerals
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116216 Minor Lab 9: Laboratory Techniques in Food Chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116216	Laboratory Techniques in food Chemistry	2	60	2 Hrs	25+25

Course Objectives	- To educate students about food constituents and their chemistry - To train the students in basic techniques in Food Chemistry. - To introduce the students common equipments of Food chemistry laboratory. - To educate the students to determine chemical properties of food
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food Science laboratory - Estimate the various constituents in food sample - Determine chemical properties of food - Prepare solutions for various experiments
List of Practical - Preparation of solutions - Standardization of solutions - Study of simple titration - Qualitative analysis of carbohydrates - Qualitative analysis of amino acids - Estimation of reducing sugar - Estimation of non-reducing sugar - Separation of amino acids by paper chromatography - Estimation of vitamin C in given sample - Estimation of calcium in given food sample - Determination of saponification value of given oil sample - Determination of acid value of given oil sample	
References - Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011 - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna. - Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016 - Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad - UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004	

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. II Semester III (Food Science)

116217 Open Elective Theory 5: Overview to Food and Nutrition							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116217	Overview to Food and Nutrition	2	30	2Hrs	30

Course Objectives	• To provide fundamental knowledge of food and nutrition • To understand the role of nutrients in human health • To learn about food groups, dietary guidelines and meal planning • To study food safety, preservation m and processing techniques • To explore the relationship between nutrition and disease prevention			
Course Outcomes	After completing this course, students will be able to : • Understand the fundamental principles of food and nutrition • Explain the significance of different nutrients in the human body • Identify sources and functions of macronutrients and micronutrients • Explain deficiency diseases associated with nutrient imbalance • Categorize different food groups and their nutritional importance • Plan a balanced diet for individuals with different nutritional needs • Explain food processing techniques and their effects on nutrition			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introducti on to nutrition	Introduction to food and nutrition. Energy value of food. Unit of energy. Basic concepts of nutrients: macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, minerals) Functions of food and importance of a balance diet: Food pyramid	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Macro and micronutri ents	Sources, functions, requirement and deficiency disorders of carbohydrates, proteins and fats Importance of dietary fibers and water	7 Hrs	7 Marks	
Unit III BMR and RDA	Sources, functions, requirement and deficiency disorders vitamins and minerals; Basal metabolic rate: definition, factors influencing BMR Recommended dietary allowance (RDA)	8 Hrs	8 Marks	
Unit IV Food groups and meal planing	Food groups: 5-7 food groups Dietary guidelines for different age groups Meal planning and balanced diet Special dietary considerations for pregnancy, lactation and elderly people Malnutrition and over nutrition	7 Hrs	7 Marks	
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M,			

	The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Contemporary Nutrition; Wardlaw, G. M. Smith, A. M. • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Food Science; Srilakshmi, B. • Fundamentals of Food and Nutrition; Mudambi, S. R. , Rajagopal M. V. • Introduction to Food Science; Parkar, R.S. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad.
Model Questions	Short Answer Questions 1. Define food and nutrition 2. What are macronutrients? Give Examples 3. What are the functions of carbohydrates? 4. Name two deficiency diseases caused by vitamins and minerals deficiency 5. List the food groups and their importance 6. What is balanced diet? 7. Explain the term RDA (Recommended Dietary Allowance)What are the Function of dietary fiber? 8. What is the importance of water in the human body 9. Define over nutrition and under nutrition Long Answer Questions 1. Discuss the importance of food and nutrition in human health 2. Explain the functions, sources and deficiency symptoms of proteins , carbohydrates and fats 3. What are micronutrients? Discuss the role of vitamins and minerals in human helath 4. Describe the classification and functions of food groups 5. Explain the principles of meal planning and balanced diet formulation 6. Discuss the role of dietary fiber in digestion and overall health Explain the causes and consequences of over nutrition 7. Discuss the significance of hygiene and sanitation in food handling and storage

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116218 VSC Lab/Practical 10 : Techniques in Food Chemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.0	III	116218	Techniques in food chemistry	2	60	2Hrs	50

Course Objectives

- To train the students to identify the food sources of various nutrients
- To impart the skill of determining various chemical properties of food
- To make students eligible to prepare solutions for various experiments
- To educate the students to apply the skills in chemical analysis of food

COs: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Determine chemical composition of food
- Distinguish between the various constituents of food
- Expertise in the preparation of solutions
- Apply the knowledge for chemical analysis of various food items

List of practical

16. Preparation of solutions for the various estimations
17. Study of chemical properties of carbohydrates
18. Demonstration of physical properties of sugars and non-sugars
19. Identification of the carbohydrate present in the given food item qualitatively
20. Identification of the amino acid present in the given food item qualitatively
21. Determination of total sugar in the given fruit juice
22. Identification of the vitamin C rich fruit juice from the given juice samples
23. Identification of the oil sample by its saponification value
24. Identification of pigments in the food by its color
25. Identification of the phytochemicals in the given food sample
26. study of gelatinization of starch
27. Study of denaturation of protein
28. Differentiation between oil and fats from its physical properties

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for VSC/ SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116219 Field Project (FP)/ Community Engagement Service (CES): FP/CES in Food Science I							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	III	116219	FP/CES I: FP/CES in Food Science I	2	60	--	50

Course Objectives:	- To provide practical, hands on experience, in the field of study, allowing them to apply theoretical knowledge to real-world situations or address Real-World Problems. - To enhance various skills such as, research, interpretation and analytical skills and strengthening their critical thinking and problem-solving abilities. - To foster engagement with a specific social issue or area of study, address specific challenges or needs within a community. - To Improve Collaboration, Communication among students and facilitate knowledge transfer and Enhance Engagement with Social issues.
Course Outcomes:	Upon successful completion of this course, students will be able to: - FP/CES can help students to develop their practical, technical skills and a deeper understanding of their subject matter and how it applies to real-world situations. - They learn to identify, analysis, and interpretation of complex problems using their knowledge and develop research skills. - Students gain insight into social issues and the role of various governmental schemes for the welfare of people and explore new ideas and approaches. - They learn to work effectively in teams and collaborate with others to achieve common goals and contributing to community's socio-economic improvements

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP)/ Community Engagement Service (CES) for TWO (2) credits i.e. 50 Marks. The guidelines/ SoP regarding the FP/CES are as follows:

- 1) The total time allocation for the student to carry out FP/CES is 60 hours.
- 2) Students should participate in FP/CES under the supervision of faculty.
- 3) Assigning the FP/CES topics to individual students or groups of students (4 to 5 students in one group) and one faculty member from the department will act as Guide for the student or group

of students.

- 4) CES may include awareness programs, public talk/ lectures, workshops, blood testing camps, vaccination drives in collaboration, surveys etc
- 5) For a SURVEY based FP/CES, related questionnaire (15 or more questions) should be prepared. The departmental coordinator/guide should check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
- 6) If the project is related to laboratory work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data analysis Experimental). The student should compile all the relevant data and carry out its analysis in laboratory.
- 7) A project report should be written individually in the standard format (2 Copies): Index, Introduction, Materials, Methods, Result, Conclusion/output, References (Numeric citation type) etc. The report should be of minimum 6 pages (excluding Title page, Certificate, Index, Acknowledgement etc.) Submit the project report with the Guide's signature to the department.
- 8) Students should maintain the documentation and record properly which includes dairy, photographs, certificates, feedback of beneficiaries, news in local paper if any.
- 9) A CES report should be written individually in the standard format (2 Copies): Index, Introduction, details of activities, photographs, signature sheets of beneficiaries, feedback of beneficiaries, own feedback, summary /output, etc. It should submit with the Guide's signature to the department.
- 10) The oral /poster presentation for all the FP/CES should be arranged in the department. To evaluate the project, examiner should be appointed by HoD.
- 11) The total work for FP/CES including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).

References

1. https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf
2. https://en.wikipedia.org/wiki/OU_Citizen_Science_Soil_Collection_Program

Distribution of Marks and the scheme of FP/CES Evaluation as follow:

Sr. No	Evaluation type	Marks
1	Student performance	20
2	FP/CES Report	20
3	Presentation (PPT or Poster)	10
Total		50

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

SECOND YEAR: SEMESTER – IV

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/ Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	a.	Major Food Science	Theory 5	116220	Food Biochemistry	2	2	10
			Theory 6	116221	Food Microbiology	2	2	
			Theory 7	116229	Food Quality and Preservation	2	2	
			Lab/ Practical-11	116222	Practical approach to food biology	2	4	
	b.	Minor/	Theory 4	116223	Fundamentals of Food Biology	2	2	6
			Lab/ Practical-12	116224	Simple techniques in food biology	2	4	
	c.	Generic/ Open Elective	Theory 6	116225	Food quality and sensory evaluation	2	2	2
	d.	VSC	Lab/ Practical-13	116226	Techniques in food chemistry	2	4	4
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/ CES	Project	116228	FP/CES in Food Science II	2	4	8
		CC	Outdoor			2	4	
		TOTAL				22	32	32

Programme: B.Sc. (Food Science)

116220 Major Theory 5: Food Biochemistry							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116220	Food Biochemistry	2	30	2Hrs	30

Course Objectives	- To acquaint the students with the basic concepts of food biochemistry. - To update the students about digestion and metabolism - To impart knowledge and importance of enzymes			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize digestion process of different food constituents - Classify the enzymes - Distinguish between the organs in GI tract and their functions - Understand the importance of metabolism - Classify digestion and absorption			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Digestion and absorption	introduction to digestion and absorption Overview of the digestive system (organs and their functions) mechanism of absorption digestion and absorption of carbohydrates, proteins and fats in mouth stomach and intestine with the enzymes involved	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Enzymes	Introduction and some basic definition regarding enzymes specificity and inhibition of enzymes IUB classification of enzymes factors affecting enzyme activity mechanism of enzyme action	7 Hrs	7 Marks	
Unit III Metabolism of lipids and proteins	Introduction to Lipid Metabolism Beta-oxidation: Breakdown of fatty acids for energy production; Synthesis of fatty acids Introduction to protein metabolism Protein synthesis; Deamination and transamination Overview to Urea cycle	8 Hrs	8 Marks	
Unit IV Metabolism of carbohydrates	introduction to the metabolism of carbohydrates cycles of carbohydrate metabolism overview to glycolysis, glycogenesis, glycogenolysis, and gluconeogenesis energetics of carbohydrate metabolism	7 Hrs	7 Marks	
References	Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M.			

	The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Biochemistry, S. C. Bhatia and Tuhina Verma , Shree Publishers & Dist. • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Science; N. N. Potter. • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency. • Fundamental of Biochemistry; J.L. jain, Sanjay Jain; C. Chand. • Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers. • Laboratory Techniques in Food Analysis; D. Pearson; Butterworths. • Principle of Biochemistry; Lehninger AL, New Delhi Kalyani • Textbook of Biochemistry; G. R. Agrawal. • Biochemistry Wesr E S Biochemistry , Delhi Oxford New Delhi • A Dictionary of Biochemistry Sharma J L New Delhi CBS Publication • Nutrition & Dietetics 1st and 2nd Edition; Subhangini Joshi.
Model Questions	Short Answer Questions 1. Define digestion 2. What is absorption? 3. Name the digestive juice secreted by liver 4. Name the main enzyme found in saliva 5. Give the name of juice secreted by pancreas 6. Why carbohydrates not digested in stomach? 7. Give the composition of bile salt 8. Give the main enzymes of pancreatic juice 9. Define coenzyme 10. Define apoenzyme 11. In IUB classification of enzymes what is IUB? 12. What is the shape of graph of effect of temperature on enzyme activity 13. Define specificity of enzymes 14. Explain chemical nature of enzyme 15. Define enzyme 16. What is deamination 17. How much energy formed during urea cycle 18. Name the mechanism of absorption of amino acids 19. Name the mechanism of absorption of fatty acids 20. Define glycolysis 21. Define glycogenolysis 22. How much energy formed during glycolysis 23. What is the end product of glycogenesis

	Long Answer Questions 1. Draw a diagram showing each organelle of digestive tract 2. Explain the digestion of protein with the name of enzymes 3. Give the names of all organelles in GI tract. Explain the function of liver and pancreas in brief 4. What are the mechanisms of absorption? Explain any one in brief 5. Explain the role of enzymes in digestion 6. Explain digestion and absorption of fatty acids 7. List the factors affecting enzyme action. Explain any one 8. Give the classification of enzyme 9. What is specificity of enzyme? Explain any one 10. State any one mechanism of enzyme action 11. Illustrate the effect of pH on enzyme activity 12. Explain deamination and transamination in brief 13. Explain the role of enzymes in the fatty acid synthesis 14. Explain urea cycle in brief 15. Draw a overview of urea cycle 16. State the significance of cholesterol 17. Give the overview of glycolysis 18. Explain glycogenesis 19. Give the significance of glycogenesis 20. Give the energetic of carbohydrate metabolism in detail
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Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116221 Major Theory 6: Food Microbiology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116221	Food Microbiology	2	30	2Hrs	30

Course Objectives	• To acquaint the students with the basic concepts of food microbiology. • To update the students about microorganisms related with food • To impart knowledge regarding the effect of microorganism on food			
Course Outcomes	Upon completion of this course successfully, students will be able to • Categorize different microorganisms with their relation with food • Categorize various microorganisms • Distinguish between various microorganisms • Identify the microorganisms related with food			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introduction to	Food microbiology: introduction, definition; Classification of microorganism, relation of microbes	8 Hrs	8 Marks	Chalk & Board, Power Point

microbes	with food Morphology, structure, and Growth of microorganisms Factors affecting growth and growth curve			Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Growth and media	Mode of nutrition and nutritional requirement of microorganisms Media preparation: composition, types, preparation and preservation Growth of culture; Introduction to microscopes	7 Hrs	7 Marks	
Unit III Staining	Various staining techniques: simple staining & differential staining Measurement of growth by various methods. Species of bacteria, moulds and yeasts important in food processing with applications ; Single cell proteins	8 Hrs	8 Marks	
Unit IV Food contamination and intoxication	Microbial contamination, causes of contamination, common food borne pathogenic microorganism Common food-borne intoxications and infections- Bacillus cereus, Clostridium botulinum, Clostridium perfringens, Enteropathogenic Escherichia coli, Salmonella, Staphylococcus aureus, Shigella spp.,	7 Hrs	7 Marks	
References	• Microbiology Vol.I &II by C.B. Powar and H.F.Daginawala. • Microbiology by M.A. Pelezar, R.D. Reid & C.S. Chan, Tata Macgraw Hill Publication Co limited, New Delhi. • Food Microbiology by W.C. Fraizer, Tata Macgraw Hill Publication. • Introduction to Microbiology by A.S. Rao • Food Microbiology by Adam Moss • Dairy Microbiology by Parihar & Parihar • Food Microbiology by Bohra Pradeep. Jodhpur Arobios India • Text book of Microbiology Purohit S, Jodhpur Arobios India • Food Microbiology Bohara & Parihar, Jodhpur Agrobias • Industrial Microbiology, Patel A H, Mumbai Mcmillan, Mumbai • General l Microbiology Vol I & II , Dr. Pawar C B Mumbai Mcmillan, Mumbai • Good contaminants origin Propagation and Analysis Mahindra SN New Delhi APH Publication • Applied microbiology Dr. Parihar Pramila , New delhi Swastik Publication • Food and Diary Microbiology Dr Rao M K New Delhi Mangalam publication • Modern Food Microbiology Jay J M , New Delhi CBS Publication • A Dictionary of Microbiology Sharma JL, New Delhi CBS Publication • Basic Food Microbiology , New Delhi CBS Pulication • Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006			

	• A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
Model Questions	Short Answer Questions 1. Define food microbiology 2. Define bacteria 3. Name the various types of microorganisms 4. What is yeast? 5. What is fungi? 6. Define generation time 7. Define eubacteria 8. List the factors affecting the growth of microbes 9. Define growth 10. Define aerobic microorganism 11. Define halofiles 12. What is media? 13. Define broth 14. Define microscope 15. Define microbiology 16. State the meaning of staining 17. Define single cell protein 18. Which microorganism used in the preparation of bread? 19. Define pathogenic bacteria 20. State contamination 21. List the factors causing contamination 22. State the significance of Ecoli Long Answer Questions 1. Classify microorganisms 2. Define bacteria and give its properties 3. Define food microbiology. state its importance in food processing 4. Draw a diagram showing the structure of bacteria 5. What is growth of microorganisms? state the factors affecting growth 6. Draw a diagram showing growth of bacteria 7. Explain each phase in the growth of microorganisms 8. List the factors affecting growth and explain any one in brief 9. Illustrate the various mode of nutrition in bacteria 10. Compare aerobic, anaerobic and facultative bacteria in brief 11. Illustrate the nutritional requirement of microorganism 12. Draw a diagram showing the typicla cell of fungi 13. Outline the various types of media 14. Give the detail of preparation of simple media 15. Give an account of microscope and its use 16. Outline the procedure for preparation of culture 17. Compare simple and differential staining 18. Outline three important species of bacteria in food with their use 19. Outline three important species of fungi in food with their use 20. Illustrate single cell protein with its significance 21. Give various methods of measurement of growth and explain any one 22. Explain serial dilution technique

	23. State various causes of contamination 24. Give the significance of common food borne microorganisms 25. Give the outline of Clostridium botulinum with its significance
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Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116229 Major Theory 7: Food Quality and Preservation							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116229	Food Quality and Preservation	2	30	2Hrs	30

Course Objectives	- To develop knowledge about quality standards and food safety systems - To understand methods for prevention and control of spoilage. - To acquaint the students with the basic concepts of food quality and preservation. - To update the students about various techniques of food preservation			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize various quality standards and food safety systems - Classify various methods of prevention of spoilage - Relate between various types of food and types of spoilage - Understand the importance of methods of food preservation			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Quality factors and spoilage	Quality attributes of foods (Appearance, Texture, Flavor, Nutritional quality) Factors affecting food quality Introduction to the methods of quality evaluation Food spoilage: Definition, causes, factors affecting, types; Common spoilage in basic food stuffs. Food preservation: Introduction, need, principles, methods & classification Food preservation by preservatives: Class I and Class II preservatives with applications	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Preservation by low temperature	Refrigerants: Introduction, desirable properties; Primary and secondary refrigerants, common refrigerants used in food preservation Refrigeration & freezing: introduction, principle, difference;	7 Hrs	7 Marks	

	Types of freezing such as sharp freezing, quick freezing, dehydro-freezing, and freeze drying; Advantages, disadvantages; Food preservation by radiation: Principle, radiations used and types. Effects on food and safety			
Unit-III Preservation by high temperature	Classification and methods; Factors affecting heat resistance of microorganisms Pasteurization: introduction, principle, types and application Sterilization: introduction, principle, types, and application Blanching: introduction, principle, and application Canning: introduction, principle, process, application	8 Hrs	8 Marks	
Unit-IV Preservation by water removal	Drying and dehydration: introduction, principle and types Solar drying and types of solar dryers. Drying by mechanical dryers and its types Factors affecting drying, treatments before and after drying, effect on food Preservation by evaporation & concentration: introduction, principle, equipments and applications, effect on food Food preservation by smoking: theory and application	7 Hrs	7 Marks	
References	- Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 - Basic principle of nutrition; Seema Yadav, Anmol publication Pvt. Ltd. New Delhi (1997) - Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California - Food Biochemistry, S. C. Bhatia and Tuhina Verma , Shree Publishers & Dist. - Food Chemistry; L. H. Meyer. - Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. - Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers - Food Science; N. N. Potter. - Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. - Nutrition Science; B. Srilakshmi; New Age International Publisher			

	• Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency. • Fundamental of Biochemistry; J.L. Jain, Sanjay Jain; C. Chand. • Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers. • Laboratory Techniques in Food Analysis; D. Pearson; Butterworths. • Principle of Biochemistry; Lehninger AL, New Delhi Kalyani • Textbook of Biochemistry; G. R. Agrawal. • Biochemistry West E S Biochemistry, Delhi Oxford New Delhi • A Dictionary of Biochemistry Sharma J L New Delhi CBS Publication • Nutrition & Dietetics 1st and 2nd Edition; Subhangini Joshi.
Model Questions	Short Answer Questions 1. Give examples of any two methods of food preservation 2. List the quality attributes of food 3. Give the names of sensory evaluation methods 4. Define sensory evaluation 5. Define quality 6. Give the types of food spoilage 7. What are class I preservatives? 8. What are class II preservatives? 9. Define food preservation 10. Define refrigerants 11. What are the methods of food preservation by low temperature? 12. Define sharp freezing 13. Define quick freezing 14. Give the sources of radiation 15. What is direct radiation? 16. What is HTST? 17. What is LTLT? 18. Define Sterilization 19. Define Pasteurization 20. Define canning 21. What is blanching? 22. What is TDT and TDP? 23. What is principle behind food preservation by moisture control? 24. What is solar Drying? 25. Give names of mechanical dryers 26. What is smoking? Long Answer Questions 1. Explain the quality factors in food 2. Justify the objectives of sensory evaluation 3. Describe the factors affecting food spoilage 4. Explain the process of selection of panel members for sensory evaluation 5. Differentiate between class I and II preservatives 6. Explain the desirable properties of refrigerants 7. Differentiate between refrigeration and freezing 8. Differentiate between quick and sharp freezing 9. Differentiate between de-hydro-freezing and freeze drying

	10. Explain the advantages and disadvantages of freeze drying 11. Describe the principles of low temperature food preservation with its types 12. Describe the method of food preservation by radiation with its advantages and disadvantages 13. Differentiate between pasteurization and sterilization 14. Differentiate between sterilization and canning 15. Give the advantages and disadvantages of pasteurization 16. Describe the factors affecting heat resistance of microbes 17. Explain blanching with its advantages and disadvantages 18. Classify various methods of pasteurization 19. Differentiate between drying and dehydration 20. Give the advantages and disadvantages of solar drying 21. Explain fluidized bed dryer 22. Explain spray dryer 23. Give the effects of drying on food 24. Describe the principle of food preservation by evaporation with advantages and disadvantages
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The distribution of marks for the Continuous Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116222 Lab 11: Practical approach to food biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116222	Lab 11: Practical approach to food biology	2	60	2 Hrs	25+25

Course Objectives	- To train the students in basic techniques in food biology. - To educate students about food biology practicals - To introduce the students to handling and working of common equipments used for food biology practicals.
Course Outcomes	After completion of this course students will be able to - Handle various equipments in Food biology lab - Evaluate the enzymes

	• Perform microbiological practicals • Prepare various media
List of Practical 1. Introduction to the equipments used for food biochemistry and microbiology 2. Demonstration of salivary amylase activity 3. Estimation of starch 4. Estimation of glycine 5. Working and handling of microscope 6. Sterilization of the various equipments 7. Preparation and sterilization of media 8. Preparation of agar plate 9. Techniques of aseptic transfer of microbes 10. Isolation of bacteria by streak plate technique 11. Preparation of staining solution 12. Simple staining technique 13. Differential staining technique 14. Staining of yeast 15. Staining of Mould	
References • Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011 • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna. • Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016 • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad • UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004 • Practical handbook of Food Microbiology, Neelam Khetarpaul , Daya Publishing House, 2016 • Food Microbiology0 N. Ramanathan NIPA, 2018 • Laboratory manual in Microbiology, R. C. Dubey & D. K. Maheshwari , S. Chand, 2019 • Microorganisms and Fermentation of traditional Foods, Ramesh C. Ray, CRC Press. 2014. • Food Microbiology Based Entrepreneurship: making Moneu From Microbes, Nataraja Amaresan , Springer, 2022.	

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116223 Minor Theory 4: Fundamentals of Food Biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116223	Fundamentals of Food Biology	2	30	2Hrs	30

Course Objectives	- To know the need and importance of study of biological aspects of food - To update the students about biochemistry and microbiology of food - To impart knowledge regarding the digestion and metabolism of food - To recall the students regarding the relation of microorganisms with food			
Course Outcomes	Upon completion of this course successfully, students will be able to - Fulfill the above objectives - Explain the importance of study of biochemistry - Discuss the various metabolic reactions - Justify the importance of microorganisms and its impact on various food. - Justify the nutritional and commercial importance of microorganisms			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Carbohydrates	Introduction and some basic definition regarding enzymes specificity and inhibition of enzymes factors affecting enzyme activity introduction to digestion and absorption Overview of the digestive system digestion and absorption of carbohydrates, proteins and fats in mouth stomach and intestine with the enzymes involved	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Protein and amino acid	introduction to the metabolism of carbohydrates; cycles of carbohydrate metabolism; overview to glycolysis Introduction to Lipid Metabolism (Beta-oxidation) Introduction to protein metabolism (Deamination and transamination) Overview to Urea cycle	7 Hrs	7 Marks	
Unit III Lipids	Food microbiology: introduction; Classification of microorganism Morphology and structure of bacteria Factors affecting growth and growth curve; Nutritional requirement of microorganisms Types of media and its composition Introduction to microscopes	8 Hrs	8 Marks	
Unit IV	Various staining techniques: simple	7 Hrs	7 Marks	

Vitamins and minerals	staining Measurement of growth by various methods. Species of bacteria, moulds and yeasts important in food processing with applications ; Single cell proteins Causes of microbial contamination			
References	• Fundamental of Biochemistry; Dr. A. C. Deb; Center Book Agency. • Fundamental of Biochemistry; J.L. Jain, Sanjay Jain; C. Chand. • Textbook of Biochemistry; Dr. Mn Chatterjee, Dr. Rana Shinde; Jaypee Brothers. • Laboratory Techniques in Food Analysis; D. Pearson; Butterworths. • Principle of Biochemistry; Lehninger AL, New Delhi Kalyani • Textbook of Biochemistry; G. R. Agrawal. • Biochemistry Wesr E S Biochemistry , Delhi Oxford New Delhi • A Dictionary of Biochemistry Sharma J L New Delhi CBS Publication • Nutrition & Dietetics 1st and 2nd Edition; Subhangini Joshi. • Microbiology Vol.I &II by C.B. Powar and H.F.Daginawala. • Microbiology by M.A. Pelezar, R.D. Reid & C.S. Chan, Tata Macgraw Hill Publication Co limited, New Delhi. • Food Microbiology by W.C. Fraizer, Tata Macgraw Hill Publication. • Introduction to Microbiology by A.S. Rao • Food Microbiology by Adam Moss • Dairy Microbiology by Parihar & Parihar • Food Microbiology by Bohra Pradeep. Jodhpur Arobios India • Text book of Microbiology Purohit S, Jodhpur Arobios India • Food Microbiology Bohara & Parihar, Jodhpur Agrobias • Industrial Microbiology, Patel A H, Mumbai Mcmillan, Mumbai • General I Microbiology Vol I & II , Dr. Pawar C B Mumbai Mcmillan, Mumbai • Good contaminants origin Propagation and Analysis Mahindra SN New Delhi APH Publication • Applied microbiology Dr. Parihar Pramila , New delhi Swastik Publication • Food and Diary Microbiology Dr Rao M K New Delhi Mangalam publication • Modern Food Microbiology Jay J M , New Delhi CBS Publication			
Model Questions	Short Answer Questions 1. Define digestion 2. What is absorption? 3. Name the main enzyme found in saliva 4. Give the name of juice secreted by pancreas 5. Why carbohydrates not digested in stomach? 6. Give the main enzymes of pancreatic juice 7. Define coenzyme 8. Define apoenzyme 9. What is the shape of graph of effect of temperature on enzyme activity? 10. Define enzyme 11. What is deamination? 12. Define glycolysis			

13. How much energy formed during glycolysis
14. What is the end product of glycogenesis
15. Define food microbiology
16. Name the various types of microorganisms
17. What is yeast?
18. Define eubacteria
19. List the factors affecting the growth of microbes
20. Define growth
21. What is media?
22. Define single cell protein
23. Define pathogenic bacteria
24. State contamination
25. List the factors causing contamination

Long Answer Questions

1. Draw a diagram showing each organelle of digestive tract
2. Explain the digestion of protein with the name of enzymes
3. Give the names of all organelles in GI tract
4. Explain the role of enzymes in digestion
5. Explain digestion and absorption of fatty acids
6. List the factors affecting enzyme action. Explain any one
7. Give the classification of enzyme
8. Illustrate the effect of pH on enzyme activity
9. Explain de-amination and trans-amination in brief
10. Draw and explain a overview of urea cycle
11. Give the overview of glycolysis
13. Classify microorganisms
14. Define bacteria and give its properties
15. Define food microbiology. state its importance in food processing
16. What is growth of microorganisms? state the factors affecting growth
17. List the factors affecting growth and explain any one in brief
18. Illustrate the nutritional requirement of microorganism
19. Outline the various types of media
20. Give the detail of preparation of simple media
21. Outline the procedure for preparation of culture
22. Illustrate single cell protein with its significance
23. State various causes of contamination

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116224 Minor Lab 12: Simple techniques in food biology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116224	Simple techniques in food biology	2	60	2 Hrs	25+25

Course Objectives	• To train the students in basic techniques in food biology. • To educate students about food biology practicals • To introduce the students to handling and working of common equipments used for food biology practicals.
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Course Outcomes	After completion of this course students will be able to • Handle various equipments in Food biology lab • Evaluate the enzymes • Perform microbiological practicals • Prepare various media
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List of Practical

1. Introduction to the equipments used for food biochemistry and microbiology
2. Demonstration of salivary amylase activity
3. Estimation of starch
4. Estimation of glycine
5. Working and handling of microscope
6. Sterilization of the various equipments
7. Preparation and sterilization of media
8. Preparation of agar plate
9. Techniques of aseptic transfer of microbes
10. Isolation of bacteria by streak plate technique
11. Preparation of staining solution
12. Simple staining technique
13. Differential staining technique
14. Staining of yeast

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004
- Practical handbook of Food Microbiology, Neelam Khetarpaul , Daya Publishing House, 2016
- Food Microbiology0 N. Ramanathan NIPA, 2018

- Laboratory manual in Microbiology, R. C. Dubey & D. K. Maheshwari , S. Chand, 2019
- Microorganisms and Fermentation of traditional Foods, Ramesh C. Ray, CRC Press. 2014.
- Food Microbiology Based Entrepreneurship: making Money From Microbes, Nataraja Amaresan , Springer, 2022.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. II Semester IV (Food Science)

116225 OE Theory 6: Food Quality and Safety							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116225	Food Quality and Safety	2	30	2Hrs	30

Course Objectives	- To understand the fundamental concept of food quality and its importance - To study various quality parameters, standards and regulatory guidelines - To explore different food quality control methods and techniques - To learn about food adulteration, Contamination and safety measures - To understand the principles and importance of sensory evaluation in food quality assessment			
Course Outcomes	After completing this course, students will be able to : - Gain knowledge of food quality attributes and their significance - Understand food quality assessment methods and their applications - Analyze food safety regulations and their impact on consumer health - Gain knowledge of sensory attributes and their impact on food quality - Understand different sensory evaluation methods and their application			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I Introducti on to Food Quality	Definition and importance of food quality Factors affecting food quality Quality attributes: Physical, chemical, microbiological and sensory aspects Role of food quality in consumer perception.	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit II Sensory evaluation	Sensory attributes (Appearance, texture, flavor, taste, etc.) Sensory evaluation: Introduction, objectives, type of panels, selection and characteristics of panel members, types of tests Subjective and objective sensory evaluation Packaging and labeling standards for food products	7 Hrs	7 Marks	
Unit III Food laws	HACCP: principles, need, and benefits Introduction to National and international food quality standards and acts: PFA, ECA, FSSAI, FDA, ISO, CODEX, BIS, WHO, CPA etc.	8 Hrs	8 Marks	
Unit IV Food Safety	Food spoilage: Definition, causes, factors affecting, types food contamination and causes Packaging; Importance, functions, types, packaging materials Food labeling: Importance, definitions, principle, categories, mandatory	7 Hrs	7 Marks	

	requirements Food safety measures and consumer protection			
References	• Advanced Text Book on Food & Nutrition (Volume I and II), Swaminathan M, The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006 • A First Course in Food Analysis, by A.Y. Sathe, New Age Int. Publication • Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California • Food Chemistry; L. H. Meyer. • Food Facts & Principle; Shakuntala Manay, M. Shadaksharaswamy; New Age International (p) Limited. • Food Hygiene and Sanitation – S. Roday • Food Quality and Sensory Evaluation – Moskowitz • Food- Nutrition and Health, Vijaya Khader; Kalyani Publishers • Food Safety and Quality Management- Yasmine Motarjemi • Food Science- B. Shrilakshmi • Food Science & Nutrition; Sunetra Roday; Oxford University Press. • Food Science; Sumati R. Mudambi, Shalini M. Rao; New Age International (p) Limited • Food Science; N. N. Potter. • Handbook of Food Analysis- Leo M. L. Nollet • Nutrition & Dietetics, Edition (I & II), Subhangini Joshi. • Nutrition Science; B. Srilakshmi; New Age International Publisher • Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad. • Sensory Evaluation of Food – Principles and Practices – Harry T. Lawless • Sensory evaluation techniques- Meilgaard, Civille			
Model Questions	Short Answer Questions 1. Define food quality 2. What are the physical attributes of food quality? 3. What is HACCP? 4. Name two international food quality standards 5. Define sensory evaluation 6. What is the role of FSSAI in food quality? 7. List two methods of food adulteration detection with example 8. Define food adulteration with an example Long Answer Questions 1. Explain the importance of food quality and its attributes 2. Describe the physical, chemical and microbiological aspect of food quality 3. Discuss the role of food quality standards and regulations in consumer safety 4. Explain the HACCP system and its significance in food quality 5. What are the different methods of sensory evaluation of food? 6. Explain how sensory panels are selected and trained 7. How does sensory evaluation help in detecting food spoilage 8. What are food adulterants? List common adulterants and their effects 9. Discuss the functions of food regulatory bodies like FSSAI and FDA			

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. II Semester IV (Food Science)

Programme: B.Sc. (Food Science)

116226 VSC Lab/Practical 13 : Techniques in food chemistry

Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.0	IV	116226	Techniques in food chemistry	2	60	2Hrs	50

Course Objectives

- To train the students to identify the food items of various groups
- To impart the skill of determining various physical properties of food
- To make students eligible to prepare different types of solutions
- To educate the students to apply the skills to prepare the emulsions and foams

COs: Upon completion of this course successfully, students will be able to

- Do focus on all the above objectives
- Perform experiments based on biochemistry and microbiology
- Prepare various types of media
- Isolate the microorganism from different samples
- Apply the knowledge of staining to observe the microorganisms

List of practical

1. Use of various equipments in the food laboratory
2. Determination of salivary amylase activity of various samples
3. Determination of starch content in various food samples
4. Determination of glycine content in various food samples
5. Study of the construction of microscope
6. Preparation and sterilization of media for a particular microorganism
7. Isolation of bacteria from various samples of water/air/food etc.
8. Application of various staining techniques for observing the structure of bacteria
9. Application of various staining techniques for observing the structure of yeast/ mold

References

- Asian Manual of Food Analysis, Institute of Nutrition, Mahidol University, Asean Foods, 2011
- Encyclopedia of Foods – A Guide to Healthy Nutrition, Academic Press-An Imprint of Elsevier, San Diego, California
- Handbook of Analysis and Quality Control for Fruits and Vegetables 2nd Edition; S. Ranganna.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products), FSSAI, 2016
- Nutritive Value of Indian Food; Dr. C. Gopalan NIN Hyderabad
- UNIDO Technology Manual, Small-scale Fruit and Vegetable, Processing and Products, 2004

Internal Evaluation for VSC/ SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc. II Semester III (Food Science)

Programme: B.Sc. (Food Science)

116228 Field Project (FP)/ Community Engagement Service (CES): FP/CES in Food Science II							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	IV	116228	FP/CES II: FP/CES in Food Science II	2	60	--	50

Course Objectives:	- To provide practical, hands on experience, in the field of study, allowing them to apply theoretical knowledge to real-world situations or address Real-World Problems. - To enhance various skills such as, research, interpretation and analytical skills and strengthening their critical thinking and problem-solving abilities. - To foster engagement with a specific social issue or area of study, address specific challenges or needs within a community. - To improve Collaboration, Communication among students and facilitate knowledge transfer and Enhance Engagement with Social issues.
Course Outcomes:	Upon successful completion of this course, students will be able to: - FP/CES can help students to develop their practical, technical skills and a deeper understanding of their subject matter and how it applies to real-world situations. - They learn to identify, analysis, and interpretation of complex problems using their knowledge and develop research skills. - Students gain insight into social issues and the role of various governmental schemes for the welfare of people and explore new ideas and approaches. - They learn to work effectively in teams and collaborate with others to achieve common goals and contributing to community's socio-economic improvements

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP)/ Community Engagement Service (CES) for TWO (2) credits i.e. 50 Marks. The guidelines/ SoP regarding the FP/CES are as follows:

- 1) The total time allocation for the student to carry out FP/CES is 60 hours.
- 2) Students should participate in FP/CES under the supervision of faculty.
- 3) Assigning the FP/CES topics to individual students or groups of students (4 to 5 students in one group) and one faculty member from the department will act as Guide for the student or group

of students. 4) CES may include awareness programs, public talk/ lectures, workshops, blood testing camps, vaccination drives in collaboration, surveys etc 5) For a SURVEY based FP/CES, related questionnaire (15 or more questions) should be prepared. The departmental coordinator/guide should check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative. 6) If the project is related to laboratory work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data analysis Experimental). The student should compile all the relevant data and carry out its analysis in laboratory. 7) A project report should be written individually in the standard format (2 Copies): Index, Introduction, Materials, Methods, Result, Conclusion/output, References (Numeric citation type) etc. The report should be of minimum 6 pages (excluding Title page, Certificate, Index, Acknowledgement etc.) Submit the project report with the Guide's signature to the department. 8) Students should maintain the documentation and record properly which includes dairy, photographs, certificates, feedback of beneficiaries, news in local paper if any. 9) A CES report should be written individually in the standard format (2 Copies): Index, Introduction, details of activities, photographs, signature sheets of beneficiaries, feedback of beneficiaries, own feedback, summary /output, etc. It should submit with the Guide's signature to the department. 10) The oral /poster presentation for all the FP/CES should be arranged in the department. To evaluate the project, examiner should be appointed by HoD. 11) The total work for FP/CES including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).	
References	1. https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf 2. https://en.wikipedia.org/wiki/OU_Citizen_Science_Soil_Collection_Program
Model Questions:	NA

Distribution of Marks and the scheme of FP/CES Evaluation as follow:

Sr. No	Evaluation type	Marks
1	Student performance	20
2	FP/CES Report	20
3	Presentation (PPT or Poster)	10
Total		50

Sant Gadge Baba Amravati University, Amravati



Faculty of Science and Technology

Syllabus and Scheme

of

Teaching, Learning, Examination and Evaluation

Under NEP-2020

For

B.Sc. in FOOD SCIENCE

(3 Years UG Course)

Semester V and VI

(Implemented w.e.f. Session 2026-27)

Submitted by Board of Studies

Biochemistry including Microbiology and Food Science

**Teaching and Learning Scheme: for the Degree of Bachelor of Science
(Three Years- Six Semesters Bachelor's Degree Programme)**

SECOND YEAR: SEMESTER –V

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload(Hrs/Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	gg.	Major Food Science	Theory 8	116230	Principles of Food Processing	2	2	16
			Theory 9	116231	Technology of Plant Based Food	2	2	
			Theory 10	116232	Hygiene, Sanitation and Food Safety	2	2	
			Lab/ Practical -15	116233	Laboratory Techniques in Food Processing	2	4	
		Major Elective	Theory 1	116234	Beverages Technology	2	2	
			Lab/ Practical 16	116235	Laboratory Techniques in Beverages	2	4	
			Theory 2	116236	Technology of Honey and Millets	2	2	
			Lab/ Practical 17	116237	Practical Technology of Honey and Millets	2	4	
	hh.	Minor/	Theory 5	116238	Quality Control and Preservation	2	2	6
			Lab/ Practical-18	116239	Laboratory Techniques in Spoilage and Preservation	2	4	
	ii.	Generic/ O E	-	-	-	-	-	-
	jj.	VSC	Lab/ Practical-19	116240	Skills in Food Product Development	2	4	8
		SEC	Lab/ Practical-20	116241	Skill Enhancement in Food Quality	2	4	
	kk.	VEC	-	-	-	-	-	0
	f.	FP/ CES	Project	116242	FP/CES in Food Science III	2	4	4
		CC						
		Non Credit	Theory		Foundation of Artificial Intelligence		02	
		TOTAL				22	34+2	34+2

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116230 Major Theory 8: Principles of Food Processing							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116230	Principles of Food Processing	2	30	2Hrs	30

Course Objectives	- To understand the objectives, principles and importance of food processing - To acquire knowledge of various cooking methods and their effects on properties of foods. - To develop awareness regarding conventional and modern food processing technologies - To gain knowledge of basic unit operations employed in food processing industries. - Understand the functions, classifications and applications of food additives used in processed foods.			
Course Outcomes	Upon successful completion of the course, students will be able to: - Explain the objectives, scope and significance of food processing - Describe various cooking methods and evaluate their effects on food quality, nutritional value and consumer acceptability. - Explain the principles, working mechanisms and applications of modern food processing technologies like microwave heating, dielectric heating, extrusion cooking, etc. - Identify and explain the role of major unit operations such as sorting, grading, peeling, size reduction, mixing and separation used in food processing. - Classify food additives and explain their functions, applications and safety considerations in processed foods.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Cooking Methods	Cooking: Meaning & objectives; Preliminary preparation of cooking with Advantages & disadvantages; Methods of cooking with Advantages & disadvantages: Moist heat methods (boiling, stewing, steaming, pressure cooking, poaching, blanching); Dry heat methods (roasting, toasting, grilling, baking, sautéing, frying, braising, etc.); Dielectric heating, ohmic heating: principle and applications, advantages and disadvantages	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Heating Types	Microwave cooking: principle, types of radiations; Microwave oven: Design, working, safe and unsafe containers; Advantages and	7 Hrs	7 Marks	

	disadvantages of microwave cooking, good handling practices Extrusion cooking: Introduction, principle, types, and applications ; Advantages and disadvantages Solar cooking: introduction, principle, application, design of solar cooker, advantages and disadvantages			
Unit-III Unit Operations	Unit operations such as cleaning, sorting, grading, peeling, size reduction, mixing, forming, sedimentation, separation (filtration, centrifugation, solvent extraction, distillation, evaporation): theory, equipments, effects on food; Membrane concentration, types of membranes, reverse osmosis; Modes of heat transfer (conduction, convection, radiation), heat exchangers	8 Hrs	8 Marks	
Unit-IV Food Additives	Food additives: Introduction, need, importance, and classification; Importance, types and application of food colors, flavoring agents, sweeteners; Functional additives such as antioxidants, emulsifiers, stabilizers (gelatin, pectin, agar), thickeners, gelling agents, humectants, etc. Safety rules and regulations.	7 Hrs	7 Marks	
References	Core References - Fellows, P. J. Food Processing Technology: Principles and Practice. Woodhead Publishing. - Potter, N. N. Food Science (5th Edition). - Mudambi, S. R., & Rao, S. M. Food Science. New Age International (P) Ltd., New Delhi. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. New Age International (P) Ltd., New Delhi. - Sivasankar, B. Food Processing and Preservation. Prentice Hall of India. - Roday, S. Food Science and Nutrition. Oxford University Press. Additional References - Meyer, L. H. Food Chemistry. - Sathe, A. Y. A First Course in Food Analysis. New Age International Publishers. - Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. National Institute of Nutrition, Hyderabad. - Srilakshmi, B. Nutrition Science. New Age International Publishers. - Khader, V. Food, Nutrition and Health. Kalyani Publishers. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.			

Model Questions	Short Answer Questions 1. Define food processing. 2. State the objectives of cooking. 3. What are moist heat cooking methods? 4. What is blanching? 5. Define microwave cooking. 6. What are dielectric materials? 7. State two advantages of pressure cooking. 8. What is extrusion cooking? 9. Define unit operation. 10. What is sorting? 11. Define peeling and mention two peeling methods. 12. Give any two examples of size reduction methods 13. Define membrane separation. 14. Explain conduction as a mode of heat transfer. 15. What is convection heat transfer? 16. Define food additives. 17. What are food colourants? 18. Define artificial sweeteners with examples. 19. Define solar cooking and mention one advantage. 20. What are flavouring agents? 21. Explain the term food safety. 22. State the significance of grading in food processing. Long Answer Questions 1. Describe the objectives and importance of food processing in food preservation and quality enhancement. 2. Explain any three methods of cooking with their principles, advantages and limitations. 3. Compare boiling, steaming, pressure cooking and frying with their effects on food quality. 4. Explain working principle and applications of microwave ovens in food processing. 5. Discuss dielectric heating and compare it with conventional heating methods. 6. Explain the principle, operation and applications of extrusion cooking in food processing. 7. Describe the concept of heat transfer. Explain conduction, convection and radiation with suitable examples from food processing. 8. Discuss the principles, advantages and applications of ohmic heating in food processing. 9. Explain solar cooking. Describe its working principle, advantages and limitations. 10. Describe the significance of unit operations in food processing industries. 11. Explain sorting, grading, peeling and size reduction as important unit operations. 12. Describe various methods of peeling and discuss their applications in food industries. 13. Explain the classification, functions and applications of food additives. 14. Discuss food colourants with respect to their types, functions and safety considerations.
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	15. Explain the role of sweeteners in food processing. Compare natural and artificial sweeteners. 16. Discuss different classes of food additives used in processed foods with suitable examples. 17. Explain food safety aspects associated with the use of food additives and processing technologies. 18. Compare conventional and modern food processing methods with suitable examples. 19. Explain the impact of different cooking methods on nutritional quality, texture and sensory characteristics of foods. 20. Explain the importance of unit operations in achieving quality, safety and efficiency in food processing. 21. Discuss the applications of sorting, grading, membrane separation and size reduction in commercial food processing. 22. Explain the classification and technological functions of preservatives, colourants, sweeteners and emulsifiers used in food products.
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Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116231 Major Theory 9: Technology of Plant based Foods							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116231	Technology of Plant based Foods	2	30	2Hrs	30

Course Objectives	- To understand the principles and technologies involved in the processing of major plant-based food commodities. - To acquire knowledge of milling processes and products for wheat, rice and maize - To understand the processing technologies, ingredients and quality attributes of bakery products such as bread, cakes and biscuits. - To preserve fruit and vegetable and make products like jam, jelly, pickles, canning and dehydration. - To understand oilseed processing, oil extraction methods and the manufacture of value-added fat and oil products.
Course Outcomes	Upon successful completion of the course, students will be able to: - Explain the principles and operations involved in milling of wheat, rice and maize and identify the characteristics and uses of milling products. - Apply the processing technology, ingredients and quality evaluation of bakery products including bread, cakes and biscuits. - Explain the principles and methods used in the processing and preservation of fruits and vegetables. - Describe oilseed processing, oil extraction techniques and the manufacture of products such as hydrogenated fats, margarine, mayonnaise and shortenings.

	Apply knowledge of processing technologies to select suitable methods for improving quality, shelf-life and value addition of plant-based foods.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Cereals Processing	Quality and rheological properties of grains; Milling of wheat, rice, corn (dry and wet): Milling products and byproducts; Parboiling of rice with advantages and disadvantages; Introduction to some processed cereal products such as puffed rice (murmura), beaten rice (poha), Dhan Lahi, popped corn, corn flakes, etc.	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Bakery Products	Bread- Functions and important of each ingredient; Types and steps in bread making, Bread faults and remedies; Biscuits and Cakes - types, ingredients and their functions, manufacturing; Introduction to other bakery products like toast, khari, cookies, pan cakes, buns etc	7 Hrs	7 Marks	
Unit-III Fruits and Vegetable Processing	Canning and bottling of fruits and vegetables in brine and syrup; factors affecting canning, common spoilage; Pickles, chutneys and sauces: Processing, types, and spoilage; Jams, jellies and marmalades: technology of manufacturing; Tomato products: Puree, paste, ketchup, sauce and soup; Dehydration of fruits and vegetables	8 Hrs	8 Marks	
Unit- IV Oil seeds Processing	Processing of oil seeds: various methods of oil extraction (advantages and disadvantages); Hydrogenated fats, Shortening, Mayonnaise, salad dressings, confectionery coatings: introduction, manufacturing, types and uses; Packing and storage of fats and oils; Soy products like soy milk, soy paneer, soy sauce, curd, soy chunk, etc.	7 Hrs	7 Marks	

References	Core References • Fellows, P. J. Food Processing Technology: Principles and Practice. Woodhead Publishing. • Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nd Edition). • Potter, N. N. Food Science (5th Edition). • Mudambi, S. R., & Rao, S. M. Food Science. • Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. • Kent, N. L., & Evers, A. D. Kent's Technology of Cereals. Additional References • Cruess, W. V. Commercial Fruit and Vegetable Products. • Pyler, E. J., & Gorton, L. A. Baking Science and Technology. • Sivasankar, B. Food Processing and Preservation. • Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI. • UNIDO Technology Manual: Small-Scale Fruit and Vegetable Processing and Products. • Shah, K. N. Analysis and Use of Melghat Honey and Kutki: Studies on Analysis of Melghat Honey and Development of Value Added Products from Honey and Kutki (Panicum sumatrense). Lambert Academic Publishing, 2022. • Nielsen, S. S. Food Analysis. • Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
Model Questions	Short Questions 1. Define cereal grains. 2. What are rheological properties of grains? 3. What is grain quality? 4. List the factors affecting grain quality. 5. Define milling. 6. What is wheat milling? 7. What is rice milling? . 8. What is parboiling? 9. State two advantages of parboiling. 10. State two disadvantages of parboiling. 11. What is puffed rice (murmura)? 12. What is beaten rice (poha)? 13. What is the function of flour in bread making? 14. Define dough fermentation. 15. Name different types of bread. 16. State the role of eggs in cake making. 17. What is baking powder? 18. State two factors affecting canning. 19. What is marmalade? 20. Define tomato puree. 21. What is tomato paste? 22. What is oil extraction? 23. Define hydrogenation. 24. Define shortening. 25. What is mayonnaise?

	26. Define salad dressing. 27. What are confectionery coatings? 28. Define soy milk., Paneer, Sauce, chunks, curd Long Questions 1. Discuss rheological properties of grains and their importance. 2. Describe wheat milling process with flow diagram. . 3. Discuss rice milling and its products. . 4. Describe wet milling of corn and its industrial applications. 5. Compare dry milling and wet milling of corn. 6. Explain parboiling of rice with processing steps. 7. Discuss advantages and disadvantages of rice parboiling. 8. Describe the manufacturing of puffed rice (murmura). 9. Explain processing of beaten rice (poha). 10. Discuss preparation and characteristics of Dhan Lahi. 11. Describe manufacturing of popped corn and corn flakes. 12. Discuss the importance of flour, yeast, sugar, salt and fat in bread making. 13. Explain steps involved in bread manufacturing. 14. Describe ingredients used in biscuit manufacturing and their functions. 15. Explain functions of ingredients used in cake making. 16. Describe the preparation of toast and khari. 17. Discuss types and manufacture of cookies. 18. Explain canning process of fruits and vegetables. 19. Describe bottling of fruits and vegetables in syrup and brine. 20. Discuss factors affecting canning. 21. Describe processing of pickles. 22. Discuss spoilage of chutneys and sauces. 23. Explain manufacturing of jelly, Jam and marmalade. 24. Discuss processing of tomato puree and tomato paste. 25. Explain manufacture of tomato ketchup and sauce. 26. Describe preparation of tomato soup. 27. Describe various methods of oil extraction. 28. Describe manufacture of hydrogenated fats. 29. Explain shortening, its types and uses. 30. Discuss manufacturing and uses of mayonnaise. 31. Describe confectionery coatings and their uses.
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Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116232 Major Theory 10: Hygiene, Sanitation and Food Safety							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	III	116232	Hygiene, Sanitation and Food Safety	2	30	2Hrs	30

Course Objectives	To understand the principles and importance of food hygiene and sanitation in food production and handling.
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	- To identify sources of food contamination and methods for their control. - To develop knowledge of food quality assessment and quality assurance systems. - To understand sensory evaluation techniques used in food quality assessment. - To familiarize students with GMP, GHP, HACCP and food safety management systems.			
Course Outcomes	After successful completion of the course, students will be able to: - Explain the principles and significance of food hygiene and sanitation. - Identify food safety hazards and suggest appropriate control measures. - Evaluate food quality using physical, chemical, microbiological and sensory parameters. - Describe sensory evaluation methods and their applications in food industries. - Apply GMP, GHP, HACCP and food safety management systems.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Hygiene and Sanitation	Food contamination: physical, chemical and biological hazards; Food-borne diseases and food poisoning; Food hygiene: concept, scope and importance; Personal hygiene; Cleaning and sanitation principles; Sanitizers and disinfectants; Plant and equipment sanitation; Pest control	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Quality assessment and Sensory evaluation	Concept of food quality and quality attributes; Quality control and quality assurance; Physical, chemical and microbiological quality assessment. Sensory evaluation: Attributes (appearance, colour, flavour, texture and taste); Sensory organs and factors affecting sensory perception; Sensory laboratory requirements and panel selection; Difference tests, ranking tests and hedonic rating tests; Applications of sensory evaluation	7 Hrs	7 Marks	
Unit-III Quality Management Systems	Quality assurance: concept and importance; Quality documentation and record keeping; Traceability and product recall systems; Total Quality Management (TQM): basic concepts Good Manufacturing Practices (GMP); Good Hygiene Practices (GHP); Standard Sanitation Operating Procedures (SSOP); Food Safety Management Systems (FSMS) Introduction to ISO 22000	8 Hrs	8 Marks	
Unit- IV HACCP	HACCP: concept and significance; Prerequisite programmes for HACCP	7 Hrs	7 Marks	

	Seven principles of HACCP Hazard analysis, Critical Control Points (CCPs) Monitoring procedures Corrective actions and verification Documentation and record keeping Applications of HACCP in food industries			
References	Core References • Roday, S. Food Hygiene and Sanitation. • Marriott, N. G., Schilling, M. W., & Gravani, R. B. Principles of Food Sanitation. • Potter, N. N. Food Science. • Mudambi, S. R., & Rao, S. M. Food Science. • Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. • Food Safety and Standards Act, Rules and Regulations. FSSAI (Latest Edition). Additional References • Forsythe, S. J. The Microbiology of Safe Food. • Jay, J. M., Loessner, M. J., & Golden, D. A. Modern Food Microbiology. • Adams, M. R., & Moss, M. O. Food Microbiology. • Meyer, L. H. Food Chemistry. • Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. • Khader, V. Food, Nutrition and Health.			
Model Questions	Short Answer Questions 1. Define food contamination. 2. What are physical hazards in food? 3. Give two examples of chemical hazards. 4. What are biological hazards? Define food-borne disease. 5. What is food poisoning? 6. Name two bacterial food-borne diseases. 7. State any two symptoms of food poisoning. 8. Define food hygiene. 9. State the importance of food hygiene. 10. What is personal hygiene? 11. Mention any two personal hygiene practices. 12. What is a sanitizer? 13. What is a disinfectant? 14. Why is pest control important? 15. Define food quality. 16. What are quality attributes? 17. Define quality control. 18. Define quality assurance. 19. Define sensory evaluation. 20. Name the major sensory attributes of food. 21. Define sanitation.			

	22. Define quality assurance. 23. What is a sensory laboratory? 24. Define difference test. 25. Define HACCP. 26. What is food hazard? 27. State the importance of HACCP Long Questions 1. Explain food contamination and its types. 2. Discuss physical hazards in foods with examples. 3. Explain chemical hazards and their sources in foods. 4. Describe biological hazards and their effects on human health. 5. Compare physical, chemical and biological hazards. 6. Describe symptoms and prevention of food-borne illnesses. 7. Explain the concept and scope of food hygiene. 8. Discuss the importance of food hygiene in food industries. 9. Describe personal hygiene requirements for food handlers. 10. Explain the relationship between food hygiene and food safety. 11. Discuss types and uses of sanitizers and disinfectants. 12. Describe plant and equipment sanitation procedures. 13. Explain integrated pest control methods in food industries. 14. Explain the concept of food quality. 15. Discuss various quality attributes of foods. 16. Differentiate between quality control and quality assurance. 17. Discuss chemical and microbiological quality assessment methods. 18. Explain sensory evaluation and its importance. 19. Explain sensory quality assessment of food products. 20. Discuss criteria for sensory panel selection. 21. Discuss ranking and hedonic rating tests. 22. Explain the concept of Total Quality Management. 23. Explain Good Manufacturing Practices (GMP). 24. Explain Food Safety Management Systems (FSMS). 25. Discuss significance of HACCP in food industries. 26. Explain identification of Critical Control Points (CCPs). 27. Explain monitoring procedures in HACCP. .
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The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116233 Major Lab 15: Laboratory techniques in Food Processing							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116233	Laboratory techniques in Food Processing	2	60	2 Hrs	25+25

Course Objectives	• To understand principles of food processing and preservation. • To study the effect of processing methods on food quality. • To develop skills in preparation and evaluation of food products. • To understand unit operations used in food processing. • To relate theoretical concepts with practical applications.
Course Outcomes	After completion of this course students will be able to • Perform food processing experiments safely. • Explain processing principles and quality changes. • Evaluate processed food products using standard methods. • Apply preservation techniques to plant-based foods. • Interpret observations and experimental results.

List of Practical

1. Comparative study of boiling, steaming and pressure cooking.
2. Comparative study of microwave and conventional cooking.
3. Demonstration of heat transfer by conduction, convection and radiation.
4. Study of moisture loss and oil uptake during frying.
5. Sorting and grading of fruits and vegetables.
6. Size reduction and sieving of food materials.
7. Milling characteristics of wheat and evaluation of flour fractions.
8. Preparation and quality evaluation of bread.
9. Preparation and quality evaluation of cake/ pancake.
10. Preparation and quality evaluation of biscuits/ cookies.
11. Preparation and quality evaluation of jam.
12. Preparation and quality evaluation of jelly.
13. Preparation and quality evaluation of tomato ketchup.
14. Preparation and evaluation of soy milk/ paneer/ curd.
15. Sensory evaluation of processed food products using hedonic scale.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis. New Age International Publishers.
- Srilakshmi, B. Food Science: Laboratory Manual.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI.
- Fellows, P. J. Food Processing Technology: Principles and Practice.
- Potter, N. N. Food Science.

Additional References

- Nielsen, S. S. Food Analysis.

- Roday, S. Food Hygiene and Sanitation.
- Asian Manual of Food Analysis. Institute of Nutrition, Mahidol University.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Shah, K. N. Analysis and Use of Melghat Honey and Kutki: Studies on Analysis of Melghat Honey and Development of Value Added Products from Honey and Kutki (*Panicum sumatrense*). Lambert Academic Publishing, 2022.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116234 Major Elective Theory 1: Beverages Technology							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116234	Beverages Technology	2	30	2Hrs	30

Course Objectives	- To introduce students to the classification, composition, and significance of alcoholic and non-alcoholic beverages. - To provide knowledge of raw materials and processing technologies used in beverage manufacture. - To understand fermentation processes involved in alcoholic beverage production. - To familiarize students with quality control, packaging, and storage aspects of beverages. - To develop awareness regarding functional, probiotic, and emerging beverage products.			
Course Outcomes	Upon successful completion of the course, students will be able to: - Classify various alcoholic and non-alcoholic beverages - Describe processing technologies involved in the manufacture of major beverage products. - Explain the role of microorganisms and fermentation in alcoholic beverage production. - Discuss quality standards, safety requirements, and regulatory aspects of beverages. - Identify opportunities and recent developments in functional and value-added beverage products.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Non-alcoholic beverages	Definition, classification and importance of beverages; Ingredients used in beverage production: water, sweeteners, acids, colours, flavours and preservatives; Carbonated beverages: ingredients, manufacture and quality characteristics; Fruit-based beverages: fruit juices, nectar, squash, cordial and RTS beverages; Sports drinks and energy drinks; Packaging and storage of non-alcoholic beverages	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Tea, Coffee and Functional Beverages	Processing and quality evaluation of tea; Types of tea: black tea, green tea, oolong tea and instant tea; Processing and quality evaluation of coffee and its types;	7 Hrs	7 Marks	

	Instant coffee manufacturing; Cocoa and chocolate beverages; Functional beverages: probiotic, prebiotic, and synbiotic beverages; Nutraceutical and herbal beverages			
Unit-III Alcoholic Beverages	Principles of alcoholic fermentation; Microorganisms used in beverage fermentation; Various types of alcoholic beverages; Wine: raw materials, processing steps and quality characteristics Beer: ingredients, brewing process and quality evaluation Distilled beverages: principles of distillation and overview of whisky, rum, brandy and vodka; Factors affecting fermentation and product quality	8 Hrs	8 Marks	
Unit- IV Emerging Trends in Beverage Industry	Quality control tests for beverages; Beverage spoilage and preservation methods; Packaging materials used for beverages; Storage stability and shelf-life evaluation; Food safety and regulatory requirements for beverages; Low-calorie and sugar-free beverages; Plant-based beverages and fermented functional drinks; Emerging trends and innovations in beverage technology	7 Hrs	7 Marks	
References	Core References - Ashurst, P. R. Chemistry and Technology of Soft Drinks and Fruit Juices. Wiley-Blackwell. - Potter, N. N. Food Science (5th Edition). - Fellows, P. J. Food Processing Technology: Principles and Practice. Woodhead Publishing. - Mudambi, S. R., & Rao, S. M. Food Science. New Age International (P) Ltd., New Delhi. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. New Age International (P) Ltd., New Delhi. - Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nd Edition). Additional References - Nielsen, S. S. Food Analysis. Springer. - Sathe, A. Y. A First Course in Food Analysis. New Age International Publishers.			

	• Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI. • Vaclavik, V. A., & Christian, E. W. Essentials of Food Science. • Khader, V. Food, Nutrition and Health. Kalyani Publishers. • Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. National Institute of Nutrition, Hyderabad.
Model Questions	Short Answer Questions 1. Define beverages. 2. Why is water quality important in beverage production? 3. Name any two ingredients used in beverage production. 4. What is the role of preservatives in beverages? 5. Name any two ingredients used in carbonated drinks. 6. What is RTS beverage? 7. What is tea processing? 8. Name one quality characteristic of coffee. 9. Name one chocolate beverage. 10. Give one example of a herbal beverage. 11. Define alcoholic fermentation. 12. What is quality control? 13. What is food safety? 14. What are low-calorie beverages? 15. Name one artificial sweetener used in beverages. Long Questions 1. Explain the definition and classification of beverages. 2. Discuss the importance of beverages in human nutrition. 3. Describe different types of beverages with suitable examples. 4. Discuss the effect of poor-quality water on beverage products. 5. Describe physical, chemical and microbiological standards of water used in beverages. 6. Explain the manufacturing process of carbonated beverages. 7. Discuss ingredients used in carbonated beverages and their functions. 8. Discuss ingredients and functions of energy drinks. 9. Describe factors affecting shelf life of non-alcoholic beverages. 10. Discuss characteristics of different types of tea. 11. Explain the processing of coffee beans. 12. Explain processing of cocoa for beverage preparation. 13. Discuss manufacture of chocolate beverages. 14. Discuss health benefits of functional beverages. 15. Explain nutraceutical beverages and their benefits. 16. Discuss herbal beverages and their applications. 17. Explain the principle of alcoholic fermentation. 18. Discuss microorganisms used in beverage fermentation. 19. Explain the role of yeast in alcoholic beverages. 20. Discuss production of baker's yeast. . 21. Discuss raw materials used in wine manufacture. 22. Discuss ingredients used in beer production. 23. Discuss manufacture of whisky, rum, brandy and vodka.

	24. Discuss factors affecting fermentation process.. 25. Explain physical quality control tests for beverages. 26. Explain causes of beverage spoilage. 27. Discuss preservation methods used in beverages. 28. Discuss beverage regulations and standards. 29. Explain formulation of low-calorie beverages. 30. Discuss fermented functional drinks and their health benefits.
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Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116235 Major Elective Lab 16: Laboratory techniques in Beverages							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116235	Laboratory techniques in Beverages	2	60	2 Hrs	25+25

Course Objectives	- To understand the principles involved in beverage processing. - To develop practical skills in preparation of different beverages. - To evaluate physicochemical and sensory quality of beverages. - To study preservation and packaging techniques used in beverage industries. - To correlate theoretical concepts with practical applications.
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Course Outcomes	After completion of this course students will be able to - Prepare various alcoholic and non-alcoholic beverages. - Perform basic quality evaluation of beverages. - Apply preservation and packaging techniques. - Evaluate consumer acceptability of beverages. - Demonstrate laboratory skills in beverage technology.
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List of Practical

1. Determination of Total Soluble Solids (TSS) of beverages using a refractometer.
2. Determination of acidity and pH of fruit beverages.
3. Preparation and quality evaluation of Ready-to-Serve (RTS) fruit beverage.
4. Preparation and quality evaluation of fruit squash.
5. Preparation and quality evaluation of fruit syrup.
6. Preparation and quality evaluation of fruit cordial.
7. Preparation and quality evaluation of carbonated lemon beverage (demonstration).
8. Preparation and evaluation of sports drink.
9. Preparation and evaluation of herbal beverage.
10. Preparation and evaluation of probiotic or fermented dairy-based beverage
11. Observation of alcoholic fermentation using baker's yeast.
12. Preparation and evaluation of non-alcoholic malt beverage or cereal-based beverage.
13. Sensory evaluation of commercial tea and coffee samples.
14. Comparative quality evaluation of packaged fruit beverages available in the market.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis.

- Srilakshmi, B. Food Science: Laboratory Manual.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI.
- Ashurst, P. R. Chemistry and Technology of Soft Drinks and Fruit Juices.
- Potter, N. N. Food Science.

Additional References

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- Fellows, P. J. Food Processing Technology.
- Asian Manual of Food Analysis.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.

OR

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116236 Major Elective Theory 2: Technology of Honey and Millet							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116236	Technology of Honey and Millet	2	30	2Hrs	30

Course Objectives	• To understand the composition, nutritional significance, and quality characteristics of honey and millets. • To learn processing, preservation, packaging, and storage techniques for honey and millet products. • To understand quality standards, safety regulations, and methods of quality evaluation. • To gain knowledge of value-added products and entrepreneurship opportunities in honey and millet processing industries.						
Course Outcomes	Upon successful completion of the course, students will be able to: • Explain the composition, nutritional value, and processing principles of honey and millets. • Perform basic quality evaluation and identify common quality defects and adulteration in honey. • Describe processing operations used in millet value addition and product development. • Develop simple value-added honey and millet products. • Identify entrepreneurship and employment opportunities in honey and millet processing industries.						
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies			
Unit-I Honey	Introduction, importance, types and sources of honey; Composition,	8 Hrs	8 Marks	Chalk & Board, Power			

Technology	nutritional and therapeutic properties of honey; Honey harvesting and extraction methods; Processing of honey: filtration, clarification, pasteurization, moisture control; Quality characteristics and defects of honey; Packaging, storage, and shelf-life			Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Quality Evaluation and Value Addition in Honey	Quality standards and specifications for honey; Adulteration in honey and detection methods; Food safety and regulatory aspects; Quality control and testing parameters; Value-added honey products: Flavoured honey, Honey spreads, Honey-based beverages, Honey confectionery products; Marketing and entrepreneurship opportunities in honey processing	7 Hrs	7 Marks	
Unit-III Millet Technology	Introduction, importance of millets in food security; Classification and nutritional composition of major millets; Anti-nutritional factors and their reduction; Post-harvest handling and storage; Processing techniques: Cleaning and grading; Dehulling and milling; Malting and germination; Fermentation; Roasting and extrusion; Quality characteristics of millet flour and products	8 Hrs	8 Marks	
Unit- IV Millet Value Addition	Traditional and modern millet-based products; Development of value-added millet foods: Bakery products, Snacks, Breakfast cereals, Instant mixes, Beverage products; Packaging and storage of millet products; Quality standards and food safety; Small-scale millet processing units; Business opportunities, start-up concepts, and market trends in millet sector	7 Hrs	7 Marks	
References	Core References - Fellows, P. J. Food Processing Technology: Principles and Practice. - Potter, N. N. Food Science. - Mudambi, S. R., & Rao, S. M. Food Science. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. - Kent, N. L., & Evers, A. D. Kent's Technology of Cereals.			

	• Srilakshmi, B. Nutrition Science. Additional References • Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. • Shah, K. N. Analysis and Use of Melghat Honey and Kutki: Studies on Analysis of Melghat Honey and Development of Value Added Products from Honey and Kutki (Panicum sumatrense). Lambert Academic Publishing, 2022. • Roday, S. Food Science and Nutrition. • Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. • Nielsen, S. S. Food Analysis. • Sathe, A. Y. A First Course in Food Analysis. • Manual of Methods of Analysis of Foods. FSSAI.
Model Questions	Short Answer Questions 1. Define honey. 2. Mention two sources of honey. 3. What are the major constituents of honey? 4. State any two therapeutic properties of honey. 5. Define honey extraction. 6. What is filtration of honey? 7. What is pasteurization of honey? 8. Why is moisture control important in honey processing? 9. Mention any two quality characteristics of honey. 10. What is honey adulteration? 11. Name any two honey quality standards. 12. What is a refractometer used for in honey testing? 13. Define flavoured honey. 14. What are honey spreads? 15. Give one example of a honey-b Long Answer Questions 1. Explain the history, importance and scope of honey processing. 2. Discuss the types and sources of honey with suitable examples. 3. Explain the composition, nutritional value and therapeutic properties of honey. 4. Describe various honey harvesting and extraction methods. 5. Explain the processing of honey including filtration, clarification and pasteurization. 6. Discuss moisture control in honey and its significance in quality maintenance 7. Describe quality characteristics and common defects of honey. 8. Explain packaging, storage and shelf-life of honey. 9. Discuss quality standards and specifications for honey. 10. Explain honey adulteration and methods used for its detection. 11. Discuss food safety and regulatory aspects related to honey processing. 12. Explain quality control tests and evaluation parameters for honey.

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116237 Major Elective Lab 17: Practical Technology of Honey and Millets							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116237	Practical Technology of Honey and Millets	2	60	2 Hrs	25+25

Course Objectives	• Understand the quality characteristics of honey and millet grains. • Perform simple processing and value-addition techniques for honey and millet products. • Evaluate the quality of processed products using basic analytical and sensory methods. • Develop practical skills in packaging, labeling, and quality assessment. • Gain hands-on experience relevant to small-scale food processing industries.
Course Outcomes	After completion of this course students will be able to • Identify different varieties of honey and millet grains. • Perform basic quality evaluation tests for honey. • Detect common adulteration in honey using simple laboratory methods. • Process millet grains into flour and other value-added products. • Prepare simple value-added honey and millet products. • Select appropriate packaging materials and prepare food labels.
List of Practical 1. Identification and classification of different honey samples and millet grains. 2. Determination of moisture content of honey. 3. Determination of specific gravity of honey. 4. Detection of common adulterants in honey by simple laboratory tests. 5. Preparation of flavoured honey (ginger, lemon, cinnamon, tulsi, etc.). 6. Sensory evaluation of different honey samples. 7. Cleaning, grading, and dehulling of millet grains. 8. Preparation of millet flour and determination of flour yield. 9. Preparation of sprouted (germinated) millet flour. 10. Preparation of millet-based cookies or biscuits. 11. Preparation of millet laddoo or energy bars. 12. Preparation of instant millet health mix/porridge. 13. Sensory evaluation of millet-based products. 14. Packaging and labeling of honey and millet products. 15. Market survey/report on commercially available honey and millet products.	
References Core References • Sathe, A. Y. A First Course in Food Analysis. • Srilakshmi, B. Food Science: Laboratory Manual. • Potter, N. N. Food Science. • Fellows, P. J. Food Processing Technology. • Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.	

- Manual of Methods of Analysis of Foods. FSSAI.

Additional References

- Nielsen, S. S. Food Analysis.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Asian Manual of Food Analysis.
- Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods.
- Shah, K. N. Analysis and Use of Melghat Honey and Kutki: Studies on Analysis of Melghat Honey and Development of Value Added Products from Honey and Kutki (*Panicum sumatrense*). Lambert Academic Publishing, 2022.

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116238 Minor Theory 5: Quality Control and Preservation							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116238	Quality Control and Preservation	2	30	2Hrs	30

Course Objectives	- To develop knowledge about quality standards and food safety systems - To understand methods for prevention and control of spoilage. - To acquaint the students with the basic concepts of food quality and preservation. - To update the students about various techniques of food preservation			
Course Outcomes	Upon completion of this course successfully, students will be able to - Categorize various quality standards and food safety systems - Classify various methods of prevention of spoilage - Relate between various types of food and types of spoilage - Understand the importance of methods of food preservation			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Quality factors and spoilage	Quality attributes of foods (Appearance, Texture, Flavor, Nutritional quality) Factors affecting food quality Introduction to the methods of quality evaluation Food spoilage: Definition, causes, factors affecting, types; Common spoilage in basic food stuffs. Food preservation: Introduction, need, principles, methods & classification Food preservation by preservatives: Class I and Class II preservatives with applications	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Preservation by low temperature	Refrigerants: Introduction, desirable properties; Primary and secondary refrigerants, common refrigerants used in food preservation Refrigeration & freezing: introduction, principle, difference; Types of freezing such as sharp freezing, quick freezing, dehydro-freezing, and freeze drying; Advantages, disadvantages; Food preservation by radiation: Principle, radiations used and types. Effects on food and safety	7 Hrs	7 Marks	
Unit-III	Classification and methods; Factors	8 Hrs	8 Marks	

Preservation by high temperature	affecting heat resistance of microorganisms Pasteurization: introduction, principle, types and application Sterilization: introduction, principle, types, and application Blanching: introduction, principle, and application Canning: introduction, principle, process, application			
Unit-IV Preservation by water removal	Drying and dehydration: introduction, principle and types Solar drying and types of solar dryers. Drying by mechanical dryers and its types Factors affecting drying, treatments before and after drying, effect on food Preservation by evaporation & concentration: introduction, principle, equipments and applications, effect on food Food preservation by smoking: theory and application	7 Hrs	7 Marks	
References	Core References - Desrosier, N. W., & Desrosier, J. N. The Technology of Food Preservation. - Fellows, P. J. Food Processing Technology: Principles and Practice. - Potter, N. N. Food Science. - Sathe, A. Y. A First Course in Food Analysis. - Nielsen, S. S. Food Analysis. - Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Additional References - Mudambi, S. R., & Rao, S. M. Food Science. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. - Srilakshmi, B. Nutrition Science. - Manual of Methods of Analysis of Foods. FSSAI. - Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.			
Model Questions	Short Answer Questions 1. Give examples of any two methods of food preservation 2. List the quality attributes of food 3. Give the names of sensory evaluation methods 4. Define sensory evaluation 5. Define quality 6. Give the types of food spoilage 7. What are class I preservatives?			

8. What are class II preservatives?
9. Define food preservation
10. Define refrigerants
11. What are the methods of food preservation by low temperature?
12. Define sharp freezing
13. Define quick freezing
14. Give the sources of radiation
15. What is direct radiation?
16. What is HTST?
17. What is LTLT?
18. Define Sterilization
19. Define Pasteurization
20. Define canning
21. What is blanching?
22. What is TDT and TDP?
23. What is principle behind food preservation by moisture control?
24. What is solar Drying?
25. Give names of mechanical dryers
26. What is smoking?

Long Answer Questions

1. Explain the quality factors in food
2. Justify the objectives of sensory evaluation
3. Describe the factors affecting food spoilage
4. Explain the process of selection of panel members for sensory evaluation
5. Differentiate between class I and II preservatives
6. Explain the desirable properties of refrigerants
7. Differentiate between refrigeration and freezing
8. Differentiate between quick and sharp freezing
9. Differentiate between de-hydro-freezing and freeze drying
10. Explain the advantages and disadvantages of freeze drying
11. Describe the principles of low temperature food preservation with its types
12. Describe the method of food preservation by radiation with its advantages and disadvantages
13. Differentiate between pasteurization and sterilization
14. Differentiate between sterilization and canning
15. Give the advantages and disadvantages of pasteurization
16. Describe the factors affecting heat resistance of microbes
17. Explain blanching with its advantages and disadvantages
18. Classify various methods of pasteurization
19. Differentiate between drying and dehydration
20. Give the advantages and disadvantages of solar drying
21. Explain fluidized bed dryer
22. Explain spray dryer
23. Give the effects of drying on food
24. Describe the principle of food preservation by evaporation with advantages and disadvantages

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116239 Minor Lab 18: Laboratory Techniques in Spoilage and Preservation							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.0	V	116239	Laboratory Techniques in Spoilage and Preservation	2	60	2 Hrs	25+25

Course Objectives	- To understand the quality characteristics of different food materials. - To identify common types of food spoilage. - To perform basic food preservation techniques. - To study the effects of different preservation methods on food quality. - To develop skills in simple quality evaluation and preservation practices.
Course Outcomes	After completion of this course students will be able to - Evaluate the quality characteristics of different food materials. - Identify common spoilage in foods and suggest preventive measures. - Apply different food preservation techniques at laboratory scale. - Compare the effectiveness of various preservation methods. - Assess the effect of preservation on sensory quality of foods.
List of Practical - Study of quality attributes (appearance, colour, texture, flavour and overall acceptability) of different food samples. - Identification of common spoilage in cereals, pulses, fruits, vegetables, milk, eggs and bread. - Sensory evaluation of fresh and spoiled food samples using a simple score card or hedonic scale. - Preservation of lemon juice or fruit squash using permitted Class II preservatives (Sodium Benzoate/Potassium Metabisulphite). - Preparation of salt-preserved products (salted lemon or salted vegetables). - Preparation of sugar-preserved products (fruit preserve or candied amla). - Study of the effect of refrigeration on the shelf life of fruits or vegetables. - Preservation of fruits or vegetables by freezing and study of quality changes after thawing.	

9. Blanching of vegetables and study of its effect on colour and quality retention.
10. Drying of fruits or vegetables by sun drying or tray drying.
11. Determination of moisture loss during drying of food materials.
12. Preparation of fruit squash or syrup by evaporation and concentration.
13. Demonstration of the canning process using seasonal fruits or vegetables.
14. Comparative study of different food preservation methods (refrigeration, freezing, drying, salt, sugar and chemical preservatives).
15. Industrial visit to a cold storage, dairy, food processing unit or dehydration plant to study commercial food preservation techniques.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis.
- Srilakshmi, B. Food Science: Laboratory Manual.
- Nielsen, S. S. Food Analysis.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
- Manual of Methods of Analysis of Foods. FSSAI.
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Additional References

- Potter, N. N. Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Asian Manual of Food Analysis.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116240 VSC Lab 19 : Skills in Food Product Development							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.5	V	116240	Skills in Food Product Development	2	60	2Hrs	50

Course Objectives

- To develop competencies in food processing operations.
- To train students in preparation of marketable food products.
- To develop skills in quality control and product standardization.
- To familiarize students with food industry practices.
- To promote self-employment and entrepreneurship skills.

COs: Upon completion of this course successfully, students will be able to

- Prepare food products using standard procedures.
- Operate food processing equipment safely.
- Standardize formulations and processing conditions.
- Assess product quality and consumer acceptability.
- Demonstrate skills useful for employment and entrepreneurship.

List of practical

1. Safe operation of microwave oven and preparation of food products.
2. Vegetable processing involving washing, sorting, grading and cutting.
3. Preparation and packaging of bread.
4. Preparation, decoration and packaging of cake.
5. Preparation and packaging of biscuits or cookies.
6. Preparation and bottling of jam.
7. Preparation and bottling of jelly.
8. Preparation and packaging of tomato Puree, Chutney and Ketchup.
9. Preparation of dehydrated fruit products.
10. Preparation of dehydrated vegetable products.
11. Preparation of soy milk/ Paneer.
12. Preparation of mayonnaise and evaluation of emulsion stability.
13. Product costing and yield calculation of a selected food product.
14. Development and presentation of a value-added food product.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis. New Age International Publishers.
- Srilakshmi, B. Food Science: Laboratory Manual.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
- Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI.
- Fellows, P. J. Food Processing Technology: Principles and Practice.
- Potter, N. N. Food Science.

Additional References

- Nielsen, S. S. Food Analysis.
- Roday, S. Food Hygiene and Sanitation.
- Asian Manual of Food Analysis. Institute of Nutrition, Mahidol University.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.

Course: B.Sc. III Semester V (Food Science)**Programme: B.Sc. (Food Science)**

116241 SEC Lab 20: Skills Enhancement in Food Quality							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.5	V	116241	Skill enhancement in Food Quality	2	60	2Hrs	50

Course Objectives

- To develop transferable skills related to food safety and quality.
- To improve documentation, analytical and communication skills.
- To create awareness regarding food regulations and consumer protection.
- To develop problem-solving and decision-making abilities.
- To strengthen employability skills through practical activities.

COs: Upon completion of this course successfully, students will be able to

- Conduct food safety and quality assessments.
- Prepare technical documents and reports.
- Interpret food labels and regulatory information.
- Communicate scientific information effectively.
- Apply food safety principles in practical situations.

List of practical

1. Personal hygiene assessment using GMP checklist.
2. Food safety audit of a canteen, restaurant or food establishment.
3. Preparation of Standard Operating Procedure (SOP) for cleaning and sanitation.
4. Preparation of Standard Sanitation Operating Procedure (SSOP) for food processing equipment.
5. Identification of physical, chemical and biological hazards in food processing.
6. Preparation of a basic HACCP plan for a selected food product.
7. Demonstration of food sampling procedures and sample collection.
8. Comparative analysis of food labels of commercial food products.
9. Detection of common adulterants in milk, turmeric, chili powder and edible oils.
10. Market survey of packaged food products.
11. Preparation of quality inspection checklist for bakery products.
12. Consumer acceptance survey of processed food products.
13. Preparation of educational poster on food hygiene and sanitation.
14. Preparation of some products from honey
15. Preparation of some products from millets
16. Processing of Coffee beans

References	
Core References	
• Sathe, A. Y. A First Course in Food Analysis. New Age International Publishers. • Srilakshmi, B. Food Science: Laboratory Manual. • Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. • Manual of Methods of Analysis of Foods (Fruit and Vegetable Products). FSSAI. • Fellows, P. J. Food Processing Technology: Principles and Practice. • Potter, N. N. Food Science.	
Additional References	
• Nielsen, S. S. Food Analysis. • Roday, S. Food Hygiene and Sanitation. • Asian Manual of Food Analysis. Institute of Nutrition, Mahidol University. • Vaclavik, V. A., & Christian, E. W. Essentials of Food Science. • Mudambi, S. R., & Rao, S. M. Food Science. • Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.	

Internal Evaluation for VSC/ SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

116242 Field Project (FP)/ Community Engagement Service (CES): FP/CES in Food Science III							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V	116242	FP/CES III: FP/CES in Food Science III	2	60	--	50

Course Objectives:	• To provide practical, hands on experience, in the field of study, allowing them to apply theoretical knowledge to real-world situations or address Real-World Problems. • To enhance various skills such as, research, interpretation and analytical skills and
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	strengthening their critical thinking and problem-solving abilities. • To foster engagement with a specific social issue or area of study, address specific challenges or needs within a community. • To Improve Collaboration, Communication among students and facilitate knowledge transfer and Enhance Engagement with Social issues.
Course Outcomes:	Upon successful completion of this course, students will be able to: • FP/CES can help students to develop their practical, technical skills and a deeper understanding of their subject matter and how it applies to real-world situations. • They learn to identify, analysis, and interpretation of complex problems using their knowledge and develop research skills. • Students gain insight into social issues and the role of various governmental schemes for the welfare of people and explore new ideas and approaches. • They learn to work effectively in teams and collaborate with others to achieve common goals and contributing to community's socio-economic improvements

As per NEP 2020, students of B Sc. II of Semester III need to perform a Field Project (FP)/ Community Engagement Service (CES) for TWO (2) credits i.e. 50 Marks. The guidelines/ SoP regarding the FP/CES are as follows:

- 1) The total time allocation for the student to carry out FP/CES is 60 hours.
- 2) Students should participate in FP/CES under the supervision of faculty.
- 3) Assigning the FP/CES topics to individual students or groups of students (4 to 5 students in one group) and one faculty member from the department will act as Guide for the student or group of students.
- 4) CES may include awareness programs, public talk/ lectures, workshops, blood testing camps, vaccination drives in collaboration, surveys etc
- 5) For a SURVEY based FP/CES, related questionnaire (15 or more questions) should be prepared. The departmental coordinator/guide should check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
- 6) If the project is related to laboratory work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data analysis Experimental). The student should compile all the relevant data and carry out its analysis in laboratory.
- 7) A project report should be written individually in the standard format (2 Copies): Index, Introduction, Materials, Methods, Result, Conclusion/output, References (Numeric citation type) etc. The report should be of minimum 6 pages (excluding Title page, Certificate, Index, Acknowledgement etc.) Submit the project report with the Guide's signature to the department.
- 8) Students should maintain the documentation and record properly which includes dairy, photographs, certificates, feedback of beneficiaries, news in local paper if any.
- 9) A CES report should be written individually in the standard format (2 Copies): Index, Introduction, details of activities, photographs, signature sheets of beneficiaries, feedback of beneficiaries, own feedback, summary /output, etc. It should submit with the Guide's signature to the department.
- 10) The oral /poster presentation for all the FP/CES should be arranged in the department. To evaluate the project, examiner should be appointed by HoD.
- 11) The total work for FP/CES including preparation of questionnaire to presentation should be

evaluated for 2 credits (50 Marks).	
References	3. https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf 4. https://en.wikipedia.org/wiki/OU_Citizen_Science_Soil_Collection_Program 5.
Model Questions:	NA

Distribution of Marks and the scheme of FP/CES Evaluation as follow:

Sr. No	Evaluation type	Marks
1	Student performance	20
2	FP/CES Report	20
3	Presentation (PPT or Poster)	10
Total		50

Course: B.Sc. III Semester V (Food Science)

Programme: B.Sc. (Food Science)

Theory: Foundation of Artificial Intelligence							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	V		Foundation of Artificial Intelligence	Non Credit	60	02	50

Introduction:

The National Education Policy (NEP) 2020 emphasizes the integration of Artificial Intelligence (AI) across all undergraduate levels and disciplines to foster digital literacy and problem-solving skills. 'It can enhance the employability of the youth and prepare professionals in cutting-edge areas.' (pg. 46, R.D Kulkarni Report).

The Foundations of Artificial Intelligence course offers an overview of the key concepts, structures, applications, and ethical aspects of AI. It helps learners understand how intelligent systems work and shape modern life. The course covers AI's definition, evolution, types, and practical uses, along with its basic architectures like rule-based systems, machine learning, and neural networks. Learners will explore AI's role in education, healthcare, and commerce while reflecting on ethical and social concerns such as privacy, bias, and automation. In line with NEP 2020, it fosters digital literacy and responsible AI awareness for all disciplines.

A. Objective

- Introduce all under graduate students of all the faculties to the basic concepts, uses, and importance of AI.
- Enable learners to understand AI's principles, applications, limitations, and effectively use AI tools.
- Encourage students to recognize AI's role in enhancing life and engage with its social and ethical implications.

B. Outcomes

- Understand the fundamental concepts, types, and evolution of Artificial Intelligence.
- Apply basic AI techniques and tools to real-world problems across different domains.
- Evaluate the social, ethical, and professional implications of AI in everyday life.

C. Implementation of Syllabus, Scheme of Examination and Teaching

- The curriculum, teaching, and examination scheme shall be as given in **Appendix A**.
- The course given in Appendix A shall be a compulsory course in the **Fifth Semester** of all undergraduate programmes of all faculties of **Sant Gadge Baba Amravati University, Amravati**.
- The medium of instruction, question paper setting, and writing of answer books shall be **English, Marathi, or Hindi**.
- The question paper shall be set and evaluated by the concerned College/Department.
- The duration of the external examination shall be **2 hours**, and the question paper shall carry **30 marks**.
- The **20 internal marks** shall be distributed as follows:
 - Attendance – **5 marks**
 - Assignment/Class Test/Viva-Voce/Presentation – **15 marks**

7. The distribution of **30 external marks** shall be based on the four units, with **15 marks allotted to short answer questions and 15 marks to long answer questions.**
8. It shall be obligatory on the part of the College/Department to conduct the examination on the date prescribed by the University and submit the candidate-wise grades on the University portal after the evaluation of answer books, as per the following grading scheme:
 - **Grade A:** 30–50 marks
 - **Grade B:** 25–29 marks
 - **Grade C:** 20–24 marks
 - **Fail:** 19 marks and below
9. The final grade shall be determined by the combined performance in the internal and external assessments. A student must secure:
 - A minimum of **30% marks in the internal assessment,**
 - A minimum of **30% marks in the external assessment,** and
 - At least **40% marks in aggregate** to pass.
 - Failure to satisfy any one of the above conditions shall result in the award of the grade "**Fail.**"
10. In case of failure, the student shall have to appear for the backlog examination by paying the prescribed examination fee.
11. The evaluated answer books shall be retained in the custody of the College for **one academic year.** The University may conduct random verification of the answer books, if required.
12. The result of the final year of the respective degree programme shall not be declared unless the student has secured any one of the grades (**A, B, or C**) in the **Foundation of Artificial Intelligence** course.
13. The grade secured by the examinee in the said course shall be reflected on both the **Fifth Semester** and the **final semester mark sheet.**
14. Every candidate shall pay **Rs. 150/-** in the Fifth Semester to the College towards the expenses incurred for teaching the course, setting and printing of question papers, evaluation of answer books, providing answer sheets, and uploading grades on the University portal. In case of failure, the student shall pay **Rs. 20/-** as the examination fee for the backlog examination. **No facility for revaluation of answer books shall be available.**
15. For teaching this course, a person possessing a **Postgraduate degree in any faculty with at least Second Class** shall be eligible. Preference shall be given to candidates possessing **Ph.D., NET, SET qualifications,** and to **regular teachers**
16. Format of Question Paper
The external examination shall carry **30 marks** and shall be based on all four units. The paper shall consist of **long and/or short answer questions with internal choice,** as follows:
 - **Question 1 (Unit I) – 8 Marks**
 - 1(a) Long and/or short answer question based on **Unit I – 8 marks**
 - OR**
 - 1(b) Long and/or short answer question based on **Unit I – 8 marks**
 - **Question 2 (Unit II) – 7 Marks**
 - 2(a) Long and/or short answer question based on **Unit II – 7 marks**
 - OR**
 - 2(b) Long and/or short answer question based on **Unit II – 7 marks**
 - **Question 3 (Unit III) – 7 Marks**
 - 3(a) Long and/or short answer question based on **Unit III – 7 marks**
 - OR**
 - 3(b) Long and/or short answer question based on **Unit III – 7 marks**

- **Question 4 (Unit IV) – 8 Marks**
4(a) Long and/or short answer question based on **Unit IV – 8 marks**
OR
4(b) Long and/or short answer question based on **Unit IV – 8 marks**

Program:				Semester:	V	
Course:	Foundation of Artificial Intelligence			Code:		
Teaching Scheme				Evaluation Scheme		
Level	Lecture	Hours	Credit	Internal	External	Total
5.5	2	2	2	20	30	50
Methods of Internal Assessment: 15Marks to Class Tests/ Assignments/ Viva-voce/ Presentation & 5 Mark to Attendance						
Course Objectives: To introduce AI concepts in a simple, real-life way with focus on understanding applications, ethics, and future opportunities.						
Course Outcomes: After completion of the course, the students will be able to:						
CO	Course Outcomes			BT Level		
CO-1	Explain the basic concepts, history, and types of AI with real-life examples.			L1–Knowledge, L2 Understanding		
CO-2	Describe AI structures and architectures using simple real-world analogies.			L2–Understanding, L3– Application		
CO-3	Identify and analyze applications of AI in the area of arts, commerce, humanities, and daily life.			L3– Application, L4 – Analysis		
CO-4	Evaluate ethical, social issues and predict future opportunities of AI in their own fields.			L4– Analysis, L5 – Evaluation		

Foundation of Artificial Intelligence

Unit I: Introduction to Artificial Intelligence

(8 Hours)

- Definition of Artificial Intelligence (AI): What is Intelligence?, Natural Intelligence vs. Artificial Intelligence
- Simple definition of AI
- History and Evolution of AI
 - From early computers to modern AI
- Types of AI: Narrow AI, General AI, Super AI
- AI in Everyday Life: Google Maps, E-commerce recommendations, Chatbots, Social media feeds
- Key Components of AI: Data, Algorithms, Computing Power

Unit II: AI Structures, Architectures and Techniques

(7 Hours)

- Basic Structure of an AI System
- AI Architectures (Simplified): Rule-Based Systems, Machine Learning, Neural Networks

- Key Concepts: Knowledge Representation (using symbols and facts), Search and Problem Solving (maze example, finding the shortest route), Natural Language Understanding (Google Translate, chatbots)

Unit III: Applications of AI in Society

(7 Hours)

- AI in Different Fields
 - **Education:** Personalized learning applications, plagiarism checkers
 - **Healthcare:** Disease prediction, medical chatbots
 - **Commerce:** Fraud detection in banking, stock market prediction, customer support
 - **Daily Life:** Smart home devices, language translation, travel assistants
- AI and Decision Making: Hiring, Loan approval, Court decisions
- Advantages of AI
- Limitations of AI

Unit IV: Ethical, Social and Future Aspects of AI

(8 Hours)

- Ethical Concerns in AI: Privacy issues (CCTV surveillance, online data), Bias and Fairness (AI favouring certain groups), Job Displacement (automation replacing human jobs)
- Responsible AI: Transparency, Accountability, Human oversight
- Future Trends in AI: Self-driving cars, AI in governance, AI in creative industries
- AI and You (Career Perspectives): Opportunities in Digital Marketing, Content Creation, Business Analytics, HR Technology, Creative Industries (non-programming careers)

Textbook

1. Mitchell, Melanie. **Artificial Intelligence: A Guide for Thinking Humans.**

Reference Books

1. Boden, Margaret A. **Artificial Intelligence: A Very Short Introduction.**
2. Rich, Elaine. **Artificial Intelligence** (3rd Edition).
3. Godbole, Achyut. **Artificial Intelligence (आर्टिफिशियल इंटेलिजन्स).** BookGanga Publications.
4. Kulkarni, Dr. Anand. **आर्टिफिशियल इंटेलिजन्सच्या वाटेवर.** Sakal Media Pvt. Ltd.
5. Russell, Stuart. **Human Compatible: Artificial Intelligence and the Problem of Control** (2019).
6. Thorpe, Josh. **AI for Students: Creative Hacks for Academic Success.** Promptly Books.

(Three Years- Six Semesters Bachelor's Degree Programme)

SECOND YEAR: SEMESTER – VI

Programme: B.Sc. (Food Science)

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Work load (Hrs/Week)	Vertical Work load (Hrs / Week)
Classroom Teaching/ Lab Work (Practical) /Outdoor/ Field	ll.	Major Food Science	Theory 11	116245	Milk, Confectionaries, and Animal Products	2	2	16
			Theory 12	116246	Food Packaging Food Laws	2	2	
			Theory 13	116247	Food Entrepreneurship and Opportunities	2	2	
			Lab/ Practical -21	116248	Practical Approach to Dairy, Confectionary and Packaging	2	4	
		Major Elective	Theory 3	116249	Fermentation Technology and Functional Foods	2	2	
			Lab/ Practical 22	116250	Laboratory Techniques in Fermentation	2	4	
			Theory 4	116251	Analytical Methods in Food Science	2	2	
			Lab/ Practical 23	116252	Analytical Methods in Food Science Lab	2	4	
	mm.	Minor/	Theory 6	116253	Food Processing Hygiene and Quality	2	2	6
			Lab/ Practical-24	116254	Food Processing and Hygiene Laboratory	2	4	
	nn.	Generic/ O E	-	-	-	-	-	-
	oo.	VSC	Lab/ Practical-25	116255	Skills in Milk Products, Confectionary and packaging	2	4	4
		SEC	-	-		-	-	
	pp.	VEC	-	-	-	-	-	0
	f.	OJT	Project	116256	On Job Training	4	8	8
		CC						
		TOTAL				22	34	34

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116245 Major Theory 11: Milk, Confectionary, and Animal Products							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116245	Milk, Confectionary, and Animal Products	2	30	2Hrs	30

Course Objectives	- Understand the composition, quality evaluation and processing of milk and dairy products. - Explain the principles involved in manufacture and preservation of major dairy products. - Understand the science and technology of confectionery products and their quality control. - Acquire basic knowledge of processing and preservation of eggs, meat and fish products. - Evaluate food safety, quality assurance and storage requirements of animal-derived foods and confectionery products.			
Course Outcomes	Upon successful completion of this course, students will be able to: - Explain the composition, properties and quality assessment of milk, confectionaries and animal food - Describe processing technologies and quality control measures for major dairy products. - Apply principles of food processing in the manufacture and evaluation of various products. - Evaluate food safety and quality assurance practices in dairy, confectionery and animal food industries.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Milk Composition, Quality and Processing	Milk: Introduction, nutritional significance, composition; Factors affecting milk composition; Milk Quality: Organoleptic evaluation, Platform tests, Detection of common adulterants, MBRT and Resazurin tests, Microbiological quality; Milk Processing: Filtration and clarification, Homogenization, Pasteurization, Packaging and storage; Various types of market milk like evaporated milk, skimmed milk, whole milk, toned milk, etc.	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Milk Products	Cream: Separation and types; Manufacturing of butter and fermented dairy products like Curd (Dahi), Yoghurt, Lassi, Buttermilk, Kefir; Cheese Making: Principles, types, manufacturing process, cheese ripening Milk Powder: Spray and roller drying;	7 Hrs	7 Marks	

	Indigenous Dairy Products: Paneer, Chhana, Khoa/Mawa, Rabri, Ghee;			
Unit-III Confectionaries	Confectionery: Introduction, types, ingredients; Role of sugar in confectionery; Sugar Confectionery: hard candy, toffee, caramel, fondant, fudge, marshmallow; Chocolate: cocoa processing and other process; Quality Defects; Packaging, Storage and Food Safety in Confectionery	8 Hrs	8 Marks	
Unit-IV Animal Products	Egg: Nutritional importance, grading, quality, preservation; Egg powder and liquid egg products Meat Processing: Post-mortem changes, meat quality evaluation, chilling and freezing Overview to cured and processed meat products Fish Processing: Drying, smoking and canning of fish Hygiene, sanitation and storage	7 Hrs	7 Marks	
References	Core References - Potter, N. N. Food Science (5th Edition). - Mudambi, S. R., & Rao, S. M. Food Science. New Age International (P) Ltd., New Delhi. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. New Age International (P) Ltd., New Delhi. - De, S. Outlines of Dairy Technology. - Fellows, P. J. Food Processing Technology: Principles and Practice. - Roday, S. Food Science and Nutrition. Additional References - Meyer, L. H. Food Chemistry. - Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. - Nielsen, S. S. Food Analysis. - Sathe, A. Y. A First Course in Food Analysis. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science. - Walstra, P. Dairy Science and Technology.			
Model Questions	Short Answer Questions - Define milk and explain its nutritional significance. - What are the major constituents of milk? - State any four factors affecting milk composition. - What is organoleptic evaluation of milk? - What are platform tests used in milk quality assessment? - Explain the principle of MBRT test. - What is the purpose of the Resazurin test? - Define homogenization and its importance.			

9. Differentiate between pasteurization and sterilization.
10. What is toned milk?
11. Define cream and mention its types.
12. What is cheese ripening?
13. Name any four indigenous dairy products.
14. What is spray drying in milk powder manufacture?
15. State any four quality defects in chocolate.

Long Answer Questions

1. Discuss the nutritional significance, composition, and factors affecting the composition of milk.
2. Explain the organoleptic evaluation and platform tests used for milk quality assessment.
3. Describe the detection methods for common milk adulterants and their significance.
4. Explain the principles, procedures, and applications of MBRT and Resazurin tests in evaluating milk quality.
5. Discuss the microbiological quality of milk and factors affecting it.
6. Explain the processing of milk, including filtration, clarification, homogenization, pasteurization, packaging, and storage.
7. Differentiate between whole milk, skimmed milk, toned milk, double toned milk, and evaporated milk.
8. Explain cream separation and discuss various types of cream.
9. Describe the manufacturing process of butter and factors affecting its quality.
10. Discuss the production, quality characteristics, and storage of fermented dairy products such as curd (dahi), yoghurt, lassi, buttermilk, and kefir.
11. Explain the principles of cheese making, types of cheese, manufacturing process, and cheese ripening.
12. Describe the manufacture of milk powder by spray drying and roller drying methods.
13. Discuss the manufacturing, quality control, and storage of milk products
14. Define confectionery and explain the role of sugar in confectionery products.
15. Discuss the manufacturing process of any one candy
16. Explain cocoa processing and the manufacture of chocolate.
17. Discuss quality defects, packaging, storage, and food safety aspects of confectionery products.
18. Discuss the nutritional importance, grading, preservation, and processing of eggs.
19. Explain the manufacture and applications of egg powder and liquid egg products.
20. Describe post-mortem changes in meat and their effect on meat quality.
21. Discuss meat quality evaluation methods and the role of chilling and freezing in meat preservation.
22. Explain cured and processed meat products with suitable examples.
23. Describe fish processing methods such as drying, smoking, and canning.
24. Discuss hygiene, sanitation, storage practices, and food safety requirements in dairy, confectionery, egg, meat, and fish products.

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116246 Major Theory 12: Food Packaging and Food Laws							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116246	Food Packaging and Food Laws	2	30	2Hrs	30

Course Objectives	- To understand the role of packaging in food preservation, safety and marketing. - To acquire knowledge of packaging materials and packaging systems used for foods. - To understand food labeling requirements and consumer information systems. - To develop awareness regarding food adulteration and methods of prevention. - To familiarize students with national and international food laws and standards.			
Course Outcomes	Upon successful completion of the course, students will be able to: - Explain the functions and importance of food packaging. - Select appropriate packaging materials for different food products. - Interpret food labels and regulatory labelling requirements. - Identify common food adulterants and explain their impact on food safety. - Describe major food laws, standards and certification systems.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Food Packaging	Functions and requirements of food packaging; Packaging materials: glass, metal, paper, paperboard, plastics, etc. Flexible and rigid packaging systems; Package selection, testing & evaluation; Packaging requirements for different foods; Shelf-life and storage considerations; Environmental aspects of packaging	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Advanced Packaging and Food Labelling	Active packaging; Intelligent packaging Modified Atmosphere Packaging (MAP) Vacuum packaging, Aseptic packaging Food labelling: objectives and importance Mandatory labelling requirements Nutritional labelling and health claims	7 Hrs	7 Marks	
Unit-III Food Adulteration	Food adulteration: concept and significance; Intentional and incidental adulteration; Common adulterants in milk, cereals, oils, spices and beverages; Simple detection techniques; Health hazards of adulteration Detection and prevention of adulteration; Consumer awareness and rights; Food fraud and food authenticity Consumer protection measures	8 Hrs	8 Marks	

Unit- IV Food Laws and Standards	Need and importance of food laws; Food Safety and Standards Act (FSS Act), 2006; Functions of FSSAI; Food standards and specifications; Introduction to Essential Commodity Act (ECA): Fruit Product Order (FPO), Vegetable Oil Product Order, Meat Product Control Order, Milk and Milk Product Order (MNPO), etc Bureau of Indian Standards (BIS), Agmark, FAO, WHO Codex: Work of codex, National Codex Contact Point (NCCP) for India, functions and responsibilities ; BIS standards; ISO standards relevant to food industries; Regulatory compliance and food business licensing	7 Hrs	7 Marks	
References	Core References - Robertson, G. L. Food Packaging: Principles and Practice. - Coles, R., McDowell, D., & Kirwan, M. J. Food Packaging Technology. - Food Safety and Standards Act, Rules and Regulations. FSSAI. - Fellows, P. J. Food Processing Technology: Principles and Practice. - Potter, N. N. Food Science. - Mudambi, S. R., & Rao, S. M. Food Science. Additional References - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. - Roday, S. Food Hygiene and Sanitation. - Nielsen, S. S. Food Analysis. - Sathe, A. Y. A First Course in Food Analysis. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science. - Packaging of Foods and Processed Products (CFTRI publications, if available).			
Model Questions	Short Answer Questions - Define food packaging and state its main functions. - Differentiate between flexible and rigid packaging systems. - List any four packaging materials used in the food industry. - What is shelf life of a food product? - Define Active Packaging. - What is Intelligent Packaging? - Expand MAP and mention its purpose. - What is Vacuum Packaging? - Define Aseptic Packaging. - State any four mandatory food labelling requirements. - What is food adulteration? - Differentiate between intentional and incidental adulteration. - Name any four common adulterants found in food products. - What are the functions of the Food Safety and Standards Authority of India (FSSAI)? - What is the role of AGMARK in food quality assurance?			

Long Answer Questions

1. Explain the functions and requirements of food packaging with suitable examples.
2. Describe various packaging materials used in food industries such as glass, metal, paper, paperboard and plastics.
3. Compare flexible and rigid packaging systems with their advantages and limitations.
4. Discuss package selection, testing and evaluation methods used in food packaging.
5. Explain packaging requirements for different food products such as dairy products, cereals, fruits and vegetables.
6. Discuss shelf-life determination and storage considerations in packaged foods.
7. Explain the environmental aspects of food packaging and sustainable packaging approaches.
8. Describe the principles, advantages and applications of Active Packaging.
9. Explain Intelligent Packaging systems and their role in food quality monitoring.
10. Discuss Modified Atmosphere Packaging (MAP), its principles, advantages and applications.
11. Explain Vacuum Packaging and Aseptic Packaging with suitable examples.
12. Discuss the objectives and importance of food labelling in the food industry.
13. Explain mandatory food labelling requirements as per FSSAI regulations.
14. Write a detailed note on nutritional labelling and health claims.
15. Define food adulteration and explain its significance in food safety.
16. Discuss intentional and incidental adulteration with suitable examples.
17. Explain common adulterants in milk, cereals, edible oils, spices and beverages along with their detection methods.
18. Discuss health hazards caused by food adulteration and measures for prevention.
19. Explain food fraud, food authenticity, consumer awareness and consumer rights in detail.
20. Describe consumer protection measures and the role of regulatory agencies in safeguarding food consumers.
21. Discuss the need and importance of food laws in India.
22. Explain the major provisions of the Food Safety and Standards Act, 2006 and the functions of FSSAI.
23. Write detailed notes on FPO, Vegetable Oil Products Order, Meat Products Order and Milk & Milk Products Order.
24. Discuss the role of BIS, AGMARK, FAO and WHO in food quality and safety.
25. Explain the Codex Alimentarius Commission, National Codex Contact Point (NCCP) of India and their functions.
26. Discuss BIS and ISO standards relevant to food industries.
27. Explain regulatory compliance requirements and food business licensing procedures under FSSAI.

Programme: B.Sc. (Food Science)

116247 Major Theory 13: Food Entrepreneurship and Opportunities							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116247	Food Entrepreneurship and Opportunities	2	30	2Hrs	30

Course Objectives	- To introduce students to entrepreneurship and self-employment opportunities in the food sector. - To familiarize students with various food-based enterprises and career opportunities in food industries. - To provide basic knowledge of food business planning, product development, startup establishment and regulatory requirements. - To create awareness regarding documentation, record keeping and business management practices. - To encourage entrepreneurial thinking and innovation among students.			
Course Outcomes	Upon successful completion of the course, students will be able to: - Identify employment and entrepreneurial opportunities in the food sector. - Explain the basic requirements for establishing a food business or startup. - Prepare a simple business plan for a food product or food enterprise. - Describe the importance of branding, packaging and marketing in food businesses. - Understand basic documentation, licensing and record-keeping requirements for food enterprises.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Entrepreneurship and Opportunities	Concept and importance of entrepreneurship; Characteristics of a successful entrepreneur; Scope of food processing industries in India; Employment opportunities in food industries; Self-employment opportunities in food sector; Small-scale food enterprises: Bakery and confectionery; Fruit and vegetable processing; Spice processing; Beverage production, etc. Success stories of food entrepreneurs	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Startups and Establishment	Concept of startup and innovation; Identification of business opportunities; Selection of food products; Basics of market survey and consumer needs; Preparation of a simple business plan Selection of location, infrastructure, and basic equipments; Sources of finance and government support schemes for food entrepreneurs;	7 Hrs	7 Marks	

	Introduction to startup incubation centres			
Unit-III Product Development and Marketing	Concept of food product development; Product idea generation and selection; Product standardization and quality considerations; Basics of packaging for food products; Brand name and brand identity; Label design and consumer information; Principles of marketing; Marketing channels for food products; Digital marketing and social media promotion; Customer satisfaction and feedback	8 Hrs	8 Marks	
Unit- IV Documentation and other management	Importance of documentation in enterprises; Purchase records, stock records and sales records; Production records and inventory management; Basics of costing and pricing of food products; Profit and loss concept; FSSAI registration and licensing; Food business operator responsibilities; Basic food safety and hygiene requirements; Business ethics and customer relations Challenges and future prospects	7 Hrs	7 Marks	
References	Core References • De, S. Outlines of Dairy Technology. • Potter, N. N. Food Science (5th Edition). • Mudambi, S. R., & Rao, S. M. Food Science. • Fellows, P. J. Food Processing Technology: Principles and Practice. • Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. • Roday, S. Food Science and Nutrition. Additional References • Walstra, P., Wouters, J. T. M., & Geurts, T. J. Dairy Science and Technology. • Sukumar De. Outlines of Dairy Technology (if you prefer not to repeat this title, replace it with another dairy reference below). • Lawrie, R. A., & Ledward, D. A. Lawrie's Meat Science. • Nielsen, S. S. Food Analysis. • Meyer, L. H. Food Chemistry. • Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods.			
Model Questions	Short Answer Questions 1. Define entrepreneurship. 2. State any four characteristics of a successful entrepreneur. 3. What is the importance of entrepreneurship in the food sector? 4. Mention any four employment opportunities in food industries. 5. What are self-employment opportunities in the food processing sector? 6. Define small-scale food enterprise.			

7. Give two examples each of bakery and confectionery products.
8. What is spice processing?
9. Define startup and innovation.
10. What is a market survey?
11. What is meant by a business plan?
12. Define food product development.
13. What is product standardization?
14. What is brand identity?
15. What is FSSAI registration?
16. Define business ethics in food enterprises.

Long Answer Questions

1. Explain the concept and importance of entrepreneurship in the food processing sector.
2. Discuss the characteristics of a successful food entrepreneur.
3. Describe the scope of food processing industries in India and their contribution to economic development.
4. Explain employment and self-employment opportunities available in food industries.
5. Discuss small-scale food enterprises such as bakery and confectionery, fruit and vegetable processing, spice processing, and beverage production.
6. Write a detailed note on the success stories of food entrepreneurs in India.
7. Explain the concept of startup and innovation in food businesses.
8. Discuss the identification of business opportunities and selection of suitable food products for entrepreneurship.
9. Explain the importance of market survey and consumer needs assessment in establishing a food enterprise.
10. Describe the preparation of a simple business plan for a food processing unit.
11. Discuss the selection of location, infrastructure, and basic equipment required for food enterprises.
12. Explain various sources of finance, government support schemes, and the role of startup incubation centres for food entrepreneurs.
13. Explain the concept of food product development and discuss the stages involved in product idea generation, selection, and standardization.
14. Discuss branding, packaging, label design, marketing channels, digital marketing, and customer satisfaction strategies for food products.
15. Explain the importance of documentation, inventory management, costing, pricing, FSSAI licensing, food safety requirements, business ethics, customer relations, challenges, and future prospects of food enterprises.
16. Discuss government schemes promoting food entrepreneurship in India.
17. Describe the importance of digital marketing and social media promotion in food businesses.
18. Explain the responsibilities of a Food Business Operator (FBO).
19. Discuss challenges faced by food entrepreneurs and suggest suitable solutions.
20. Explain future prospects of the Indian food processing industry with suitable examples.

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116248 Major Lab 21: Practical approach to Dairy, Confectioneries and Packaging							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116248	Practical approach to Dairy, Confectioneries and Packaging	2	60	2 Hrs	25+25

Course Objectives	- To develop practical skills in preparation and quality evaluation of dairy, confectionery and animal food products. - To learn the techniques in preparation of various food products - To understand food packaging, labelling, adulteration and food laws. - To familiarize students with packaging materials and quality standards.
Course Outcomes	After completion of this course students will be able to - Prepare selected dairy and confectionery products. - Evaluate the quality of food products and packaging materials. - Detect common food adulterants. - Interpret food labels according to regulatory requirements. - Apply food safety and packaging principles in food industries.

List of Practical

1. Preparation of paneer and evaluation of its quality.
2. Preparation of khoa and khoa-based products.
3. Preparation of butter or ghee from cream.
4. Preparation of caramel, toffee or milk toffee.
5. Preparation of chocolate or simple confectionery products.
6. Identification and study of different packaging materials used for food products.
7. Comparative study of packaging materials for different food commodities.
8. Study and interpretation of mandatory and optional information on food labels.
9. Preparation of a model food label according to FSSAI guidelines.
10. Detection of common adulterants in milk.
11. Detection of common adulterants in edible oils, spices and cereals.
12. Determination of net weight and package integrity of packaged food products.

13. Comparative shelf-life study of packaged and unpackaged food products.
14. Visit to a dairy, confectionery unit, packaging industry or food processing unit.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis.
- Srilakshmi, B. Food Science: Laboratory Manual.
- De, S. Outlines of Dairy Technology.
- Robertson, G. L. Food Packaging: Principles and Practice.
- Manual of Methods of Analysis of Foods. FSSAI.
- Fellows, P. J. Food Processing Technology.

Additional References

- Nielsen, S. S. Food Analysis.
- Potter, N. N. Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116249 Major Elective Theory 3: Fermentation Technology and Functional Foods							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116249	Fermentation Technology and Functional Foods	2	30	2Hrs	30

Course Objectives	- To understand the principles and applications of fermentation in food processing. - To study the production and importance of fermented foods and industrial fermentation products. - To understand the concept of functional foods and bioactive food components. - To develop knowledge of probiotics, prebiotics and synbiotics and their role in health promotion. - To familiarize students with recent trends in functional foods and sustainable food processing.			
Course Outcomes	After successful completion of the course, students will be able to: - Explain the principles and applications of fermentation in food processing. - Identify important microorganisms used in food fermentation. - Prepare and evaluate selected fermented food products. - Describe the role of functional foods and bioactive components in human health. - Differentiate probiotics, prebiotics and synbiotics and explain their applications. - Demonstrate awareness of sustainable and value-added food products.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Fermentation	Fermentation: Introduction, definition and history; Types of fermentation; Microorganisms used in food fermentation (bacteria, yeasts and moulds); Principles of fermentation; Factors affecting fermentation; Importance of fermentation in food processing; Advantages and limitations of fermentation	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Fermentation products	Fermenters: Introduction, types and structure of a typical fermenter; Production of vinegar, Baker's yeast, Organic acids, Food enzymes; Traditional fermented foods of India (Idli, Dosa, Dhokla, Jalebi, Kanji, etc.); Sustainable fermentation and green processing (overview)	7 Hrs	7 Marks	

Unit-III Functional foods	Functional foods: Introduction, definition and classification; Functional food ingredients; Bioactive components: dietary fibre, phytochemicals, omega-3 fatty acids, plant sterols and antioxidants; Functional foods from food processing by-products (fruit pomace, cereal bran, whey—brief introduction); Health benefits of functional foods	8 Hrs	8 Marks	
Unit- IV Probiotics, prebiotics and synbiotics	Probiotics: Definition, importance, selection criteria, microorganisms and mechanism of action Prebiotics: Definition, characteristics, sources and health benefits Synbiotics: Definition, types and applications Regulatory and safety aspects Emerging trends and future prospects	7 Hrs	7 Marks	
References	Core References - Stanbury, P. F., Whitaker, A., & Hall, S. J. Principles of Fermentation Technology. Elsevier. - Steinkraus, K. H. Handbook of Indigenous Fermented Foods. - Fellows, P. J. Food Processing Technology: Principles and Practice. - Potter, N. N. Food Science (5th Edition). - Mudambi, S. R., & Rao, S. M. Food Science. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. Additional References - Batt, C. A., & Tortorello, M. L. Encyclopedia of Food Microbiology (Vols. I–III). - Adams, M. R., & Moss, M. O. Food Microbiology. - Jay, J. M., Loessner, M. J., & Golden, D. A. Modern Food Microbiology. - Roday, S. Food Science and Nutrition. - Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.			
Model Questions	Short Answer Questions - Define fermentation. - Briefly explain the history of food fermentation. - What are the different types of fermentation? - Name the major microorganisms used in food fermentation. - What is the biochemical basis of fermentation? - State any four factors affecting fermentation. - What is a fermenter? - List the components of a typical fermenter. - What are functional foods? - Define bioactive components with examples. - What are probiotics?			

12. Define prebiotics and give two examples.
13. What are synbiotics?

Long Answer Questions

1. Define fermentation and discuss its history, importance, and applications in food processing.
2. Explain the different types of fermentation with suitable examples.
3. Describe the microorganisms used in food fermentation, including bacteria, yeasts, and moulds.
4. Discuss the principles and biochemical basis of fermentation.
5. Explain the factors affecting fermentation and their role in product quality.
6. Discuss the advantages and limitations of fermentation in food preservation and processing.
7. Describe the structure and working of a typical fermenter with a diagram.
8. Explain the types of fermenters used in food industries and their applications.
9. Discuss the industrial production of vinegar and baker's yeast.
10. Explain the production of organic acids and food enzymes through fermentation.
11. Discuss green processing approaches in the food industry.
13. Define functional foods and explain their classification with suitable examples.
14. Discuss any one functional food ingredients and bioactive components
15. Explain the utilization of food processing by-products (fruit pomace, cereal bran, and whey) in the development of functional foods.
16. Discuss the health benefits of functional foods
17. Define probiotics and explain their importance, selection criteria, microorganisms involved, and mechanism of action.
18. Discuss the characteristics, sources, and health benefits of prebiotics.
19. Explain synbiotics, their types, applications, and significance in human health.
20. Explain emerging trends and future prospects in fermented foods, functional foods, probiotics, and synbiotics.
21. Discuss factors affecting fermentation.
22. Compare different types of fermentation.
23. Describe microorganisms used in food fermentation.
24. Production of vinegar and baker's yeast.
25. Traditional fermented foods of India.
26. Classification of functional foods.
27. Bioactive components and their health benefits.

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116250 Major Elective Lab 22: Laboratory techniques in Fermentation							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116250	Laboratory techniques in Fermentation	2	60	2 Hrs	25+25

Course Objectives	- To develop practical skills in the preparation and evaluation of fermented food products. - To study microorganisms and bioactive ingredients used in functional foods. - To understand the preparation of value-added and functional food products.
Course Outcomes	After completion of this course students will be able to - Prepare common fermented food products using simple techniques. - Evaluate fermented foods based on sensory characteristics. - Identify common microorganisms used in food fermentation. - Demonstrate the use of functional ingredients in food products. - Explain the health benefits of functional foods and probiotic products.
List of Practical - Study of common microorganisms used in food fermentation (yeasts, lactic acid bacteria and moulds) using charts, photographs or cultures. - Preparation of curd (dahi) and evaluation of its quality. - Preparation of idli or dosa batter and observation of the fermentation process. - Preparation of bread using baker's yeast. - Preparation of vinegar by demonstration or laboratory method. - Preparation of a fermented beverage (e.g., buttermilk or probiotic drink). - Comparative study of fermented and unfermented foods based on sensory evaluation. - Study of commercially available probiotic food products and interpretation of label information. - Preparation of a functional beverage fortified with natural bioactive ingredients (e.g., lemon-ginger drink, amla beverage or herbal beverage). - Preparation of a high-fibre functional food using oats, wheat bran or millet. - Preparation of a value-added product incorporating prebiotic ingredients (e.g., banana, garlic, onion or chicory-based ingredients). - Identification and study of functional food ingredients available in the market (dietary fibre, omega-3 fortified foods, phytochemical-rich foods, etc.). - Sensory evaluation of fermented and functional food products using a hedonic score card. - Industrial visit to a bakery, dairy, fermented food industry or functional food manufacturing unit and preparation of a report. - Seminar or assignment on recent developments in fermented foods, probiotics or functional foods.	
Core References - Shen, C. Food Microbiology Laboratory for the Food Science Student: A Practical Approach. - Sathe, A. Y. A First Course in Food Analysis. - Srilakshmi, B. Food Science: Laboratory Manual. - Stanbury, P. F., Whitaker, A., & Hall, S. J. Principles of Fermentation Technology. - Manual of Methods of Analysis of Foods. FSSAI. - Fellows, P. J. Food Processing Technology. Additional References - Nielsen, S. S. Food Analysis. - Batt, C. A., & Tortorello, M. L. Encyclopedia of Food Microbiology. - Adams, M. R., & Moss, M. O. Food Microbiology. - Potter, N. N. Food Science.	

- Mudambi, S. R., & Rao, S. M. Food Science.
- Asian Manual of Food Analysis.

OR

Course: B.Sc. III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116251 Major Elective Theory 4: Analytical Methods in Food Science							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116251	Analytical Methods in Food Science	2	30	2Hrs	30

Course Objectives	• To understand the principles and importance of laboratory techniques used in food quality control. • To learn sample collection, preparation, handling, and quality assurance procedures. • To understand the working principles and applications of modern analytical instruments used in food analysis. • To interpret analytical results for food quality, safety, authenticity, and regulatory compliance.			
Course Outcomes	After successful completion of the course, students will be able to: • Explain laboratory organization, safety practices, sampling procedures and quality assurance systems. • Describe the principles and applications of classical analytical methods and basic instrumental techniques used in food quality analysis. • Understand chromatographic and spectroscopic techniques for analysis of food components, contaminants and adulterants. • Interpret analytical data and explain the applications of immunological, molecular and rapid analytical techniques in food quality control.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Quality Control Lab	Food QC lab: objectives and functions; Good Laboratory Practices (GLP); Laboratory safety and chemical handling; Sampling and sample preparation; Accuracy, precision and analytical errors; Calibration of laboratory instruments; QA and QC concepts; Standard methods (AOAC, BIS, FSSAI)	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and
Unit-II	Principle, working, and food application	7 Hrs	7 Marks	

Basic Analytical Instruments	of various laboratory instruments such as, Analytical balance, Microscopes, Colorimeter, UV–Visible spectrophotometer, pH meter, Refractometer, Conductivity meter, Moisture analyzer, Water activity meter, etc.			answering sessions
Unit-III Advanced Analytical Techniques	Principle, working, and food application of Chromatography, Paper chromatography, TLC, HPLC (Introduction), GC (Introduction), etc. Atomic Absorption Spectroscopy (AAS) FTIR (Introduction)	8 Hrs	8 Marks	
Unit- IV Rapid Food Analysis Techniques	Principle, working, and food application of ELISA, PCR (Introduction), Biosensors Rapid methods for food adulteration detection Rapid methods for pathogen detection Interpretation of analytical reports	7 Hrs	7 Marks	
References	Core References - Nielsen, S. S. Food Analysis. - Sathe, A. Y. A First Course in Food Analysis. - Nielsen, S. S. Introduction to the Chemical Analysis of Foods (or another analytical text if available). - Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. - Manual of Methods of Analysis of Foods. Food Safety and Standards Authority of India (FSSAI), New Delhi. - Asian Manual of Food Analysis. Institute of Nutrition, Mahidol University. Additional References - AOAC International. Official Methods of Analysis of AOAC International. - Meyer, L. H. Food Chemistry. - Potter, N. N. Food Science. - Fellows, P. J. Food Processing Technology. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science. - Srilakshmi, B. Food Science: Laboratory Manual.			
Model Questions	Short Answer Questions - Define Food Quality Control (QC) laboratory. - State the objectives of a food QC laboratory. - What are Good Laboratory Practices (GLP)? - Define laboratory safety. - What is sampling in food analysis? - Differentiate between accuracy and precision. - What are analytical errors? - Why is calibration of laboratory instruments necessary? - Define Quality Assurance (QA) and Quality Control (QC). - What is AOAC and its significance in food analysis?			

11. State the principle of a pH meter.
12. What is a refractometer used for in food analysis?
13. Define chromatography.
14. What is ELISA?
15. What are biosensors and their applications in food analysis?

Long Answer Questions

1. Explain the objectives and functions of a Food Quality Control laboratory.
2. Discuss Good Laboratory Practices (GLP) and their importance in food analysis.
3. Describe laboratory safety measures and proper chemical handling procedures in food laboratories.
4. Explain sampling techniques and sample preparation methods used in food analysis.
5. Differentiate between accuracy and precision with suitable examples.
6. Discuss various analytical errors and methods to minimize them.
7. Explain the importance of calibration of instruments in quality analysis.
8. Compare Quality Assurance (QA) and Quality Control (QC) in food industries.
9. Discuss the role of standard methods such as AOAC, BIS, and FSSAI in food quality evaluation.
10. Explain the principle, working, and food applications of an analytical balance.
11. Describe the principle, working, and applications of a colorimeter and UV–Visible spectrophotometer in food analysis.
12. Explain the principle, operation, and applications of a pH meter, conductivity meter, and refractometer.
13. Discuss the working principle and food applications of a moisture analyzer and water activity meter.
14. Compare different laboratory instruments used for food quality assessment and their industrial applications.
15. Explain the principle, working, and applications of chromatography in food analysis.
16. Discuss paper chromatography and thin-layer chromatography (TLC) with their advantages and limitations.
17. Explain the principle, instrumentation, and applications of HPLC.
18. Describe the principle and applications of Gas Chromatography in food quality.
21. Explain the principle, working, and food applications of ELISA.
22. Explain biosensors and their applications in food quality monitoring and adulteration detection.
23. Discuss rapid methods used for food adulteration detection.
24. Explain rapid methods used for pathogen detection in foods.
25. Explain the role of modern analytical techniques in ensuring food safety and quality assurance.
26. Objectives and functions of Food QC laboratory.
27. Explain BIS, and FSSAI standards.

Course: B.Sc III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116252 Major Elective Lab 23: Analytical Methods in Food Science Lab							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116252	Analytical Methods in Food Science Lab	2	60	2 Hrs	25+25

Course Objectives	- To understand the principles and importance of laboratory techniques used in food quality control. - To familiarize themselves with the operation, calibration, and applications of commonly used analytical instruments in food laboratories. - To understand the principles and applications of advanced analytical techniques used for food quality, safety, and authenticity. - To develop the ability to interpret analytical results and maintain quality standards in food testing laboratories.
Course Outcomes	After completion of this course students will be able to - Explain laboratory organization, Good Laboratory Practices (GLP), laboratory safety, sampling methods, etc. used in food quality control laboratories. - Describe the principles, operation, calibration, and applications of basic analytical instruments used for food quality evaluation. - Explain the principles and applications of chromatographic, spectroscopic, immunological, and molecular techniques used in food analysis. - Interpret analytical results and identify appropriate analytical techniques for food quality assessment, adulteration detection, and food safety evaluation.

List of Practical

1. Study of laboratory safety rules, Good Laboratory Practices (GLP), and laboratory equipment.
2. Sampling and sample preparation techniques for food analysis.
3. Calibration and operation of an analytical balance.
4. Calibration and use of a pH meter.
5. Determination of Total Soluble Solids (TSS) using a refractometer.
6. Estimation of colour intensity of a food sample using a colorimeter.
7. Determination of absorbance of a food sample using a UV–Visible spectrophotometer.
8. Determination of moisture content using a moisture analyzer or hot air oven (demonstration if analyzer is unavailable).
9. Separation of food colours by paper chromatography.
10. Separation of plant pigments or amino acids using Thin Layer Chromatography (TLC).
11. Demonstration of High Performance Liquid Chromatography (HPLC) for analysis of sugars or preservatives.
12. Demonstration of Gas Chromatography (GC) for flavour compounds or fatty acid analysis.
13. Demonstration of ELISA for detection of food allergens or pathogens.
14. Study and interpretation of laboratory analytical reports for food quality evaluation.
15. Preparation and maintenance of laboratory records and quality control documentation.

References

Core References

- Nielsen, S. S. Food Analysis.

- Sathe, A. Y. A First Course in Food Analysis.
- Srilakshmi, B. Food Science: Laboratory Manual.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.
- Manual of Methods of Analysis of Foods. FSSAI.
- Asian Manual of Food Analysis.

Additional References

- AOAC International. Official Methods of Analysis of AOAC International.
- Potter, N. N. Food Science.
- Meyer, L. H. Food Chemistry.
- Fellows, P. J. Food Processing Technology.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116253 Minor Theory 6: Food Processing, Hygiene and Quality							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116253	Food Processing, Hygiene and Quality	2	30	2Hrs	30

Course Objectives	- To understand the principles and importance of food preparation, cooking, and basic food processing operations. - To explain the changes occurring in food during processing and the role of processing techniques in improving food quality and shelf life. - To understand the concepts of food quality, food additives, packaging, and sensory evaluation of food products. - To develop an understanding of food hygiene, sanitation, and basic food safety practices to ensure safe handling, processing, and storage of foods.			
Course Outcomes	After successful completion of the course, students will be able to: - Explain the principles, methods, and effects of cooking and basic food processing operations on the quality and nutritional value of foods. - Describe the functions and applications of common food processing equipment, packaging materials, and unit operations used in food preparation and processing. - Evaluate the quality characteristics of foods and explain the role of food additives, packaging, and sensory evaluation in maintaining food quality. - Apply the principles of food hygiene, sanitation, Good Hygiene Practices (GHP), Good Manufacturing Practices (GMP), and basic HACCP concepts to ensure food safety during preparation, processing, storage, and serving.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit-I Principles of Food Preparation	Objectives and importance of cooking; Methods of cooking; Heat transfer during cooking; Physical, chemical and nutritional changes during cooking; Factors affecting cooking quality; Nutrient losses during cooking and their prevention;	8 Hrs	8 Marks	Chalk & Board, Power Point Presentation, Videos, Group Discussion, Assignments, surprise quizzes, question and answering sessions
Unit-II Food Processing Operations	Primary and secondary processing; Unit operations in food preparation: Cleaning, Washing, Sorting, Grading, Peeling, Cutting, Size reduction, Mixing, Kneading, Filtration; Kitchen and food processing equipment - Microwave oven - Induction cooking;	7 Hrs	7 Marks	

	Packaging of processed foods (basic concept)			
Unit-III Food Quality	Meaning and importance of food quality; Quality attributes: Appearance, Colour, Flavour, Texture, Nutritional quality; Sensory evaluation (basic concept); Food additives used in processed foods: Colours, Flavours, Preservatives, Emulsifiers, Stabilizers; Food adulteration (brief introduction)	8 Hrs	8 Marks	
Unit- IV Food Hygiene and Safety	Personal hygiene; Food hygiene; Cleaning and sanitation; Sources of contamination, Cross-contamination; Good Manufacturing Practices (GMP); Good Hygiene Practices (GHP) Introduction to HACCP Waste management Food safety during storage and serving	7 Hrs	7 Marks	
References	Core References - Fellows, P. J. Food Processing Technology: Principles and Practice. - Roday, S. Food Hygiene and Sanitation. - Potter, N. N. Food Science. - Mudambi, S. R., & Rao, S. M. Food Science. - Food Safety and Standards Act, Rules and Regulations. FSSAI. - Sathe, A. Y. A First Course in Food Analysis. Additional References - Marriott, N. G., Schilling, M. W., & Gravani, R. B. Principles of Food Sanitation. - Nielsen, S. S. Food Analysis. - Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. - Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles. - Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods. - Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.			
Model Questions	Short Answer Questions - Define cooking and state its objectives. - What is the importance of cooking in food preparation? - Name the three modes of heat transfer during cooking. - Differentiate between moist heat and dry heat cooking methods. - What are the physical changes that occur during cooking? - What are the chemical changes that occur during cooking? - Mention any four factors affecting cooking quality. - What are nutrient losses during cooking? - State any four methods to prevent nutrient losses during cooking. - Define primary processing and secondary processing.			

11. What is grading in food processing?
12. Define sensory evaluation.
13. What are food additives? Give two examples.
14. What is cross-contamination?
15. Expand GMP, GHP, and HACCP.

Long Answer Questions

1. Explain the objectives and importance of cooking in food preparation.
2. Discuss various methods of cooking with suitable examples.
3. Explain the different modes of heat transfer during cooking.
4. Discuss the physical, chemical, and nutritional changes occurring during cooking.
5. Explain the factors affecting cooking quality and their significance.
6. Discuss nutrient losses during cooking and methods for their prevention.
7. Differentiate between primary and secondary food processing with suitable examples.
8. Explain the unit operations involved in food preparation: cleaning, washing, sorting, grading, peeling, cutting, and size reduction.
9. Discuss the principles and applications of mixing, kneading, and filtration in food processing.
10. Explain the construction, working, advantages, and limitations of a microwave oven.
11. Discuss the principle, operation, advantages, and applications of induction cooking.
12. Explain various kitchen and food processing equipment used in food preparation.
13. Write a note on the basic concepts and importance of packaging of processed foods.
14. Define food quality and explain its importance in food processing industries.
15. Discuss the quality attributes of food: appearance, colour, flavour, texture, and nutritional quality.
16. Explain the basic concept, methods, and importance of sensory evaluation in food quality assessment.
17. Discuss various food additives used in processed foods, including colours, flavours, preservatives, emulsifiers, and stabilizers.
18. Write a short essay on food adulteration and its effects on consumer health.
19. Explain the importance of personal hygiene and food hygiene in food service establishments.
20. Discuss cleaning and sanitation procedures used in food industries.
21. Explain the sources of food contamination and cross-contamination with preventive measures.
22. Discuss Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) in food industries.
23. Explain the concept, principles, and importance of HACCP in food safety management.
24. Discuss waste management practices in food processing industries.
25. Explain food safety measures during storage and serving of foods.
26. Discuss the role of hygiene and sanitation in preventing foodborne illnesses.

The distribution of marks for the Continues Assessment Test (CAT) shall be as follows:

Internal Assessment (Theory) for 20 marks		
MCQ Test 1 base on 25% syllabus	Consider best 2 out of 3 test	10 Marks
MCQ Test 2 base on 50% syllabus		
MCQ Test 3 base on 75% syllabus		
Assignments /Innovative activities /GD/Seminar/ Poster presentation, quiz etc (any two activity 5 mark each)		10 Marks
Total		20 Marks

Course: B.Sc III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116254 Minor Lab 24: Food Processing and Hygiene Laboratory							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116254	Food Processing and Hygiene Laboratory	2	60	2 Hrs	25+25

Course Objectives	- To perform basic food preparation and processing operations using standard laboratory practices. - To observe and evaluate the effects of different cooking and processing methods on food quality. - To assess the sensory quality of food products and identify common food additives and packaging materials. - To demonstrate good hygiene, sanitation, and safe food handling practices during food preparation and processing
Course Outcomes	After completion of this course students will be able to - Perform basic food preparation and processing operations using appropriate techniques and equipment. - Compare the effects of different cooking methods on the quality and nutritional characteristics of foods. - Evaluate the sensory quality of food products and identify commonly used food additives and packaging materials. - Apply good hygiene, sanitation, and safe food handling practices while preparing, processing, and storing food.

List of Practical

1. Study of laboratory and kitchen safety practices and personal hygiene.
2. Demonstration of cleaning, washing, sorting, grading and peeling of fruits and vegetables.
3. Study of different cutting techniques for fruits and vegetables (dicing, slicing, chopping, julienne, etc.).
4. Preparation of a food product using boiling and steaming methods and comparison of quality.
5. Preparation of a food product using roasting, baking or frying methods and comparison of

- quality.
6. Cooking of a food product using a microwave oven and comparison with conventional cooking.
 7. Study of common kitchen equipment and food processing utensils.
 8. Preparation of an emulsion (e.g., mayonnaise or salad dressing) and observation of emulsion stability.
 9. Identification and study of commonly used food additives from packaged food labels.
 10. Sensory evaluation of food products using a simple score card (appearance, colour, flavour, texture and overall acceptability).
 11. Study and identification of different food packaging materials and their uses.
 12. Demonstration of cleaning and sanitation of food contact surfaces using suitable cleaning agents and sanitizers.
 13. Observation of cross-contamination and demonstration of preventive measures during food preparation.
 14. Study of food labels and interpretation of mandatory labelling information on packaged foods.
 15. Preparation of a simple Standard Operating Procedure (SOP) or hygiene checklist for a kitchen or food laboratory.

References

Core References

- Sathe, A. Y. A First Course in Food Analysis.
- Srilakshmi, B. Food Science: Laboratory Manual.
- Fellows, P. J. Food Processing Technology.
- Roday, S. Food Hygiene and Sanitation.
- Manual of Methods of Analysis of Foods. FSSAI.
- Ranganna, S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products.

Additional References

- Nielsen, S. S. Food Analysis.
- Potter, N. N. Food Science.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Asian Manual of Food Analysis.

The distribution of marks for the practical examination shall be as follows:

External Evaluation		Internal Evaluation based on CAT	
Performance of any two experiments	20 marks	Attendance & Students performance	10 Marks
Viva-voce	05 marks	Practical Record Book	05 Marks
		MCQ test/ Viva-Voce	10 Marks
Total	25 Marks	Total	25 Marks

Course: B.Sc III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116255 VSC Lab 25 : Skills in Milk Products, Confectioneries, and Packaging							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum marks
5.5	VI	116255	Skills in Milk Products, Confectioneries, and Packaging	2	60	2Hrs	50

Course Objectives

- To develop entrepreneurial and managerial skills in food business.
- To provide hands-on experience in food product development, business planning and marketing.
- To familiarize students with licensing, finance and startup procedures.

COs:

Upon completion of this course successfully, students will be able to

- Identify food business opportunities.
- Develop value-added food products.
- Prepare business plans and project reports.
- Understand licensing and marketing strategies.
- Apply entrepreneurial skills for establishing food enterprises.

List of practical

1. Preparation and packaging of Paneer for commercial sale.
2. Preparation and packaging of Flavoured Milk or Lassi.
3. Preparation of Milk Toffee or Caramel Candy.
4. Preparation and packaging of Chocolate or Nut Chocolate.
5. Preparation of a Value-added Dairy Product (Shrikhand, Flavoured Yoghurt or Ice Cream Mix). Identification of food business opportunities in the local area.
6. Selection of a food product for entrepreneurship based on market demand and designing a brand name, logo and attractive food label for a product.
7. Conduct of a simple market survey using a structured questionnaire.
8. Preparation of a business plan for a small-scale food enterprise.
9. Calculation of production cost and selling price of a food product.
10. Preparation of promotional materials (poster, brochure or social media advertisement) for a food product.
11. Study of procedures for obtaining FSSAI registration, GST registration and other required licenses.
12. Preparation of packaging suitable for a selected food product.
13. Development and presentation of an innovative value-added food product.
14. Visit to a successful food startup, MSME or food processing industry and preparation of an industrial visit report.
15. Case study presentation on successful food entrepreneurs and startups.

References

Core References

- Potter, N. N. Food Science.
- Fellows, P. J. Food Processing Technology: Principles and Practice.
- Sathe, A. Y. A First Course in Food Analysis.

- Srilakshmi, B. Food Science: Laboratory Manual.
- De, S. Outlines of Dairy Technology.
- Manual of Methods of Analysis of Foods. FSSAI.

Additional References

- Nielsen, S. S. Food Analysis.
- Robertson, G. L. Food Packaging: Principles and Practice.
- Mudambi, S. R., & Rao, S. M. Food Science.
- Manay, N. S., & Shadaksharaswamy, M. Foods: Facts and Principles.
- Vaclavik, V. A., & Christian, E. W. Essentials of Food Science.
- Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. Nutritive Value of Indian Foods.

Internal Evaluation for VSC/ SEC	
Attendance	10 Marks
Practical performance	20 Marks
MCQ/ Viva	10 Marks
Practical Record book	10 Marks
Total	50 Marks

Course: B.Sc III Semester VI (Food Science)

Programme: B.Sc. (Food Science)

116256: Internship/ Apprenticeship/ OJT (On the Job Training)							
Level	Semester	Course code	Course Name	Credits	Teaching Hours	Exam Duration	Max marks
5.5	VI	116256	Internship/ Apprenticeship/ OJT (On the Job Training)	2	60	--	100

Course Objectives	• To provide practical exposure to the functioning of food industries, food testing laboratories, research institutions, or allied organizations. • To apply theoretical knowledge of Food Science in real-life industrial and professional settings. • To develop technical skills related to food processing, quality assurance, food safety, laboratory analysis, and documentation. • To familiarize students with industrial practices, Good Manufacturing Practices (GMP), Good Laboratory Practices (GLP), hygiene, sanitation, and workplace safety. • To develop professional ethics, communication skills, teamwork, problem-solving ability, and time management through hands-on training.
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	To prepare students for employment, entrepreneurship, and higher education through experiential learning.
Course Outcomes	Upon successful completion of this course, students will be able to: - Demonstrate practical knowledge of food processing, food quality control, food safety, or related industrial operations. - Apply laboratory and analytical techniques for testing and evaluating food quality under professional supervision. - Follow Good Manufacturing Practices (GMP), Good Laboratory Practices (GLP), hygiene, sanitation, and workplace safety procedures. - Work efficiently as an individual and as a member of a multidisciplinary team while exhibiting professional ethics and responsibility. - Analyze industrial practices and suggest appropriate scientific solutions for simple food processing or quality-related problems.

Guidelines / Standard Operating Procedure (SoP) for Internship / Apprenticeship / On-the-Job Training (OJT)

For understanding the key principles, operational guidelines, and implementation strategy of Internship/Apprenticeship/On-the-Job Training (OJT), students and institutions may refer to:

- https://www.ugc.gov.in/pdfnews/2051511_Internship-Research-Internship-Guidelines.pdf
- <https://www.sgbau.ac.in/pdf/1092Internship%20Policy.pdf>

Internship / Apprenticeship / OJT

As per the National Education Policy (NEP-2020), students of **B.Sc. III (Food Science)** are required to complete an **Internship/Apprenticeship/OJT** carrying **Four (04) Credits**, equivalent to **100 Marks**.

Guidelines

1. Credits: 04

2. Duration: 120 Hours

3. Internship Period

Ideally, the internship should be completed during the summer vacation between the Second and Third Year. Students who are unable to complete the internship during this period may complete it before the end of Semester VI through any of the following modes, subject to approval by the parent institution:

- Part-time internship during Semester V or VI
- During Diwali or Winter Vacation
- Any other approved period as permitted by the University/College

4. Internship Categories

i. Internship for Enhancing Employability

This internship aims to develop professional skills, industrial exposure, technical competency, workplace ethics, communication skills, and understanding of food industry operations.

ii. Internship for Developing Research Aptitude and Practical Exposure

Research internships provide hands-on training in laboratory techniques, food analysis, quality evaluation, research methodologies, scientific documentation, instrumentation, and product development.

5. Implementation and Assessment

Implementation, evaluation, assessment, report submission, presentation, and viva-voce examination shall be conducted as per the Standard Operating Procedure (SoP) or guidelines issued by the University from time to time.

6. Internship may be carried out in

- Food Processing Industries
- Dairy and Milk Processing Industries
- Fruit and Vegetable Processing Units
- Bakery and Confectionery Industries
- Beverage Manufacturing Industries
- Food Testing and Analytical Laboratories
- Food Quality Control and Quality Assurance Laboratories
- Food Safety Laboratories
- Research Institutes and Universities
- Government Food Testing Laboratories
- FSSAI-recognized Food Testing Laboratories
- MSMEs, Start-ups and Food Processing Enterprises
- Colleges and University Departments
- Online/Virtual Internship with Report and Viva Evaluation

Suggested Areas for Internship / Apprenticeship / OJT

A. Laboratory and Analytical Training

1. Food quality testing laboratory internship
2. Food chemical analysis and quality evaluation
3. Food microbiological testing laboratory training
4. Milk and dairy product analysis
5. Water quality testing for food industries
6. Cereal, pulse and flour quality evaluation
7. Fruit and vegetable quality assessment
8. Edible oil and fat quality analysis
9. Food packaging material testing
10. Shelf-life evaluation and storage studies

B. Food Industry-Based OJT

1. Fruit and vegetable processing industry
2. Dairy and milk product manufacturing units
3. Bakery and confectionery industries
4. Beverage manufacturing industries
5. Spice processing and packaging industries
6. Ready-to-eat and ready-to-cook food industries
7. Grain milling and cereal processing industries
8. Snack food manufacturing units
9. Food packaging industries
10. Food quality assurance and production departments

C. Food Safety and Quality Assurance

1. Good Manufacturing Practices (GMP) implementation
2. Good Hygiene Practices (GHP)
3. HACCP documentation and implementation
4. Food Safety Management Systems (FSMS)
5. ISO 22000 documentation and quality systems
6. Food inspection and regulatory compliance
7. Laboratory quality assurance and documentation

D. Research and Academic Exposure

1. Research internship in universities, research laboratories, ICAR institutes, CFTRI, NIFTEM, or other premier institutions

2. Food product development and standardization
3. Food processing equipment handling and instrumentation
4. Food packaging and shelf-life studies
5. Nutritional evaluation of food products
6. Scientific documentation, report writing, and laboratory management

E. Entrepreneurship and Skill-Based OJT

1. Small-scale food processing and value addition
2. Fruit and vegetable preservation
3. Bakery and confectionery product preparation
4. Preparation of millet-based functional foods
5. Dairy product manufacturing
6. Ready-to-eat and ready-to-cook food preparation
7. Spice processing and packaging
8. Food packaging and labeling
9. Food business management and entrepreneurship
10. Development and marketing of value-added food products

References	https://www.ugc.gov.in/pdfnews/2051511_Internship-Research-Internship-Guidelines.pdf https://www.sgbau.ac.in/pdf/1092Internship%20Policy.pdf
Model Questions	N.A.