

As Per NEP 2020

UNIVERSITY OF MUMBAI



Title of the programme

A- P.G. Diploma in Home Science – Food Processing and Preservation	}	2023- 24
B- M.Sc. (Home Science – Food Processing and Preservation) (Two Years)		
C- M.Sc. (Home Science – Food Processing and Preservation) (One Year)		2027- 28

Syllabus for

Semester – Sem I

Ref: GR dated 16th May, 2023 for Credit Structure of PG

Preamble

1) Introduction

The College of Home Science Nirmala Niketan had instituted a M.Sc. programme in Foods and Nutrition in the year 1972, which was later amended to M.Sc. in Foods, Nutrition and Dietetics – a programme that covered the diverse areas of Foods, Nutrition and Dietetics. This highly successful programme has produced many acclaimed nutritionists in the field who have been gainfully employed in the various streams of the foods, nutrition and dietetics industries.

The field of nutrition is an extremely dynamic one and has evolved greatly in the last many decades. Advancement has been especially in the area of food processing and preservation as the food industry exponentially increased its products and its consumer reach. Thus, there arose a need to look at a new specialization which could produce nutritionists specially trained in this niche area. With this purpose the M.Sc. programme in Food Processing and Preservation was started in the year 2010.

The M.Sc. programme in Food Processing and Preservation has been restructured with the guidelines and the goals of the National Education Policy 2020. This programme in Food Processing and Preservation provides an in-depth knowledge of both theoretical and practical components across the diverse areas of the subject. The coursework includes advanced concepts of core subjects required in designing food products for individuals at different stages of the life cycle. These core subjects include human nutrition, nutritional biochemistry and nutrition across the lifecycle. The programme enables advanced knowledge and skill development in the specialised areas of food processing and preservation such as food chemistry, food science, food processing and quality control, food preservation, packaging and food informatics, and food engineering with inputs on ethical and sustainable food production.

The elective courses have been designed in order to provide students with opportunities to obtain insights and skill development in newer areas of food production, food science and quality control using latest research and trends with emphasis on the use of technology and innovative ideas. In the current times of evolution of thought with respect to sustainable practices, this syllabus draws the students' attention to the UN Sustainable Development Goals (SDGs) related to health. Electives have been offered on ethics and sustainability in the food processing industry to ensure that future professionals qualified in the areas of food processing and quality control hold these values as a priority.

Focus has been given to areas of innovation, entrepreneurship and sustainability in the food health. Through this programme the student will get multiple opportunities to create and innovate with regards to food product development with inputs in Intellectual Property Rights (IPR) which they can continue ahead into their professional career.

The strong emphasis on research methods, descriptive and advanced statistics and research project strengthens the students' scientific temper and builds research expertise and applications. The courses in research methods and statistics will help the students to understand the techniques and methodologies used across the diverse branches of study in the field of Food Processing and Preservation.

The M.Sc. in Food Processing and Preservation will deliver a holistic education that is in line with the goals of the National Education Policy 2020. The theory and practical learnings will help the students establish a niche career for themselves. They will be able to provide specialized expertise

in the field to ensure that safe and healthy food products reach the market, thus being a significant contributor to the health and wellness of individuals, communities and the nation and participating in the creation of sustainable health.

2) Aims and Objectives

- a. To help students create a strong understanding of fundamental, advanced and applied concepts in the field of food processing and preservation.
- b. To equip students with knowledge, skills and research competencies for practical applications into the areas of food science and processing, and food quality and its control.
- c. To develop in students the ability to think critically, conduct innovative research projects in relation to food product development, processing, preservation and quality control, embrace new technologies, blend creativity with health and sustainable development goals to bring outcomes for improved individual and community well-being.
- d. To foster an entrepreneurial mindset in students in the food processing and preservation course, enabling them to identify and seize opportunities within the industry, develop innovative food products, and create sustainable ventures in the field.
- e. To create competent professionals who work with acknowledgement of the dynamism and evolution in the field and are capable of keeping up with the emerging trends and practices in the field and have a vision to contribute to national and global development.
- f. To develop skilled professionals who recognize the rapid rate of research and technological advancement in the food industry, possess the skills to adapt to new trends, and work with a perspective to contribute to both national and global health improvement.

3) Programme Outcomes

The programme encompasses a comprehensive range of skills and knowledge, enabling graduates to excel in the multifaceted field of Food Processing and Preservation. On successful completion of the programme, student will be able to be a competent and valuable member of the fraternity as outlined below:

Programme Outcome (PO)	Definition	Graduate Attribute
	To be able to...	
PO1	Demonstrate an in-depth knowledge and understanding of core fundamentals of concepts of food preservation, food processing and its production. This will enable them to professionally practice in the industry of food preservation and processing competently.	Disciplinary Knowledge
PO2	Effectively develop holistic nutritious and sustainable food products, and to explain complex nutritional concepts in simple and understandable terms by both orally and in written communication to fellow professionals as well as the community.	Communication Skills

PO3	Design innovative food products for health, using sustainable methods, efficient processing methods along with its analysis to better community health will be addressed.	Critical Thinking
PO4	Creatively construct dietary, nutritional and lifestyle based products which help to preserve health, manage diseases, address nutrition related health issues in the community; to support the industry as a knowledge partner in formulation of healthy food products; and to engage in entrepreneurial initiatives to solve individual and community health problems.	Problem Solving Innovation Entrepreneurial Skills
PO5	Competently evaluate both traditional and newer food processing practices in relation to research-based products and draw applicable conclusions, using a scientific and an open mind with the vision of bettering food preservation and processing.	Analytical and Scientific Reasoning
PO6	Proficiently explore the cause-and-effect relationships of lifestyles on health and through a research-based temper and statistical analysis, draw adequate conclusions for applications of research in the food preservation and processing industry and community either as an employee or entrepreneur.	Research related skills
PO7	Successfully work in teams; and cooperate and derive significant and valuable conclusions for consumers of processed food through an interdisciplinary and collaborative efforts in the food preservation industry, community, research and organizational set-ups.	Cooperation /Team work
PO8	Translate research, recent innovations and personal and professional experiences into applications to benefit food processing and packaging industry, community health; and entrepreneurial ventures with self-awareness and contemplation.	Reflective Thinking
PO9	Use technology for food preservation and processing its communication, consumer information, hospital administration, nutrition education as well as be aware of using digitation for entrepreneurial ventures.	Information/digital literacy
PO10	Work independently or in groups, identify appropriate resources for a project and manage a project to its fruitful completion.	Self – Directed Learning

PO11	Be adept with use of national and global multi-cultural aspects of foods and nutrition, thus being able to deliver food products and nutrition and lifestyle strategies for health in harmony with the existing cultural practices of the individual and the community.	Multi-cultural competence
PO12	Practice safe principles of food preservation, processing, and community health in the most sustainable and effective manner, placing consumer, patient, community and fraternity well-being at the centre of all operations and to refrain from unethical behaviour at workplace, the community and research.	Moral and Ethical awareness and reasoning
PO 13	To ensure that all aspects of the Intellectual Property Rights (IPR) are adhered to in the interest of the community.	Moral and Ethical values
PO14	Take on leadership positions in food product development its formulation its packaging and sharing an inspiring vision and the eagerness to bring productive and sustainable positive results for the professional group, the community and the food processing and packaging industry using organizational, entrepreneurial and managerial skills.	Leadership readiness/qualities
PO15	Continue lifelong training and be updated with cutting edge knowledge and practices in the field and the understanding that ongoing learning has to be the personal and professional way of life; thus, being continuously involved in evolving, up scaling, reinventing and reskilling to the requirements of the times.	Lifelong learning

4) Any other point (if any):

5) CREDIT STRUCTURE OF THE PROGRAMME (SEMESTER – I)

(Table as per Parishishta 1 with sign of HOD and Dean)

R _____

Post Graduate Programme in University:

A. P.G. Diploma in Home Science – Food Processing and Preservation

B. M.Sc. (Home Science – Food Processing and Preservation) (Two Years)

Parishishta – 1

Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/ FP	RP	Cum. Cr.	Degree
			Mandatory*	Electives (Any one)					
I	6.0	Sem-I	Course 1 Advances in Food Science and Food Chemistry (Th) (4 Cr)	Course 5 Elective 1 A. Traditional Indian Foods (Th) (2 Cr) B. Food Product Development using Indigenous Foods (Pr) (2 Cr) OR Elective 2 A. Sustainability in Food Production (Th) (2 Cr) B. Valorization of Food Waste through Food Product Development (Pr) (2 Cr)	Course 6 Research Methods in Home Science (Th) (4 Cr)	-	-	22	PG Diploma (after 3 Year Degree)
			Course 2 A. Advanced Food Microbiology (Th) (2 Cr) B. Advanced Food Science (Pr) (2 Cr)						
			Course 3 Principles of Food Preservation (Th) (4 Cr)						
			Course 4 Descriptive Statistics in Home Science (Th) (2 Cr)						
Sem – I (For PG Diploma/ M.Sc. Year I)			14	4	4	-	-	22	

Note: Curriculum will be enriched with extension work and educational trips for experiential learning with supplemental credits.

A MOOC course on SWAYAM, NPTEL and Coursera can be completed with supplemental credits.

CREDIT STRUCTURE OF THE PROGRAMME (SEMESTER – II)

(Table as per Parishishta 1 with sign of HOD and Dean)

R _____

Post Graduate Programme in University:

A. P.G. Diploma in Home Science – Food Processing and Preservation

B. M.Sc. (Home Science – Food Processing and Preservation) (Two Years)

Parishishta – 1

Exit option: PG Diploma (44 Credits) after Three Year UG Degree									
Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/ FP	RP	Cum. Cr.	Degree
			Mandatory*	Electives (Any one)					
I	6.0	Sem-II	Course 1 Nutrition Across Lifespan (Th) (4 Cr)	Course 5 Elective 1 A. Management of Micro Food Enterprise (Th) (2 Cr) B. Management of Micro Food Enterprise (Pr) (2 Cr) OR Elective 2 A. Nutrition and Food Safety Education (Th) (2 Cr) B. Food Safety Education and Consumer Awareness (Pr) (2 Cr)	-	(4 Cr)	-	22	PG Diploma (after 3 Year Degree)
			Course 2 A. Fundamentals of Food Processing Technology (Th) (2 Cr) B. Fundamentals of Food Analysis and Microbiology (Pr) (2 Cr)						
			Course 3 Food Safety and Quality Assurance (Th) (4 Cr)						
			Course 4 Advanced Statistics in Home Science (Th) (2 Cr)						
Sem – II (For PG Diploma/ M.Sc. Year I)			14	4	-	4	-	22	
Cum. Cr. For PG Diploma			28	8	4	4	-	44	

Note: Curriculum will be enriched by extension work and educational trips for experiential learning with supplemental credits.

A MOOC course on SWAYAM, NPTEL and Coursera can be completed with supplemental credits.

Students need to complete a mandatory summer internship/ project (4 weeks) during the summer vacation with supplemental credits.

CREDIT STRUCTURE OF THE PROGRAMME (SEMESTER – III)
(Table as per Parishishta 1 with sign of HOD and Dean)

R _____

Post Graduate Programme in University:

- A. M.Sc. (Home Science – Food Processing and Preservation) (Two Years)
 B. M.Sc. (Home Science – Food Processing and Preservation) (One Year)

Parishishta – 1

Exit option: PG Diploma (44 Credits) after Three Year UG Degree									
Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/ FP	RP	Cum. Cr.	Degree
			Mandatory*	Electives (Any one)					
II	6.5	Sem- III	Course 1 Nutrition and Biochemistry (Th) (4 Cr)	Course 5 Elective 1 A. Therapeutic Foods for Health and Disease (Th) (2 Cr) B. Therapeutic Food Product Development and Shelf-life Studies (Pr) (2 Cr) OR Elective 2 A. Food Auditing (Th) (2 Cr) B. Food Auditing (Pr) (2 Cr)	-	-	Course 6 Research Project (4 Cr)	22	PG Degree (after 3 Year UG)
			Course 2 A. Advances in Food Processing Technology (Th) (2 Cr) B. Advances in Food Analysis and Microbiology (Pr) (2 Cr)						
			Course 3 Advanced Study of Food Safety and Quality Assurance (Th) (4 Cr)						
			Course 4 Entrepreneurship and Innovation (Th) (2 Cr)						
Sem – III (For M.Sc Degree)			14	4	-	-	4	22	

Note: Curriculum will be enriched with extension work and educational trips for experiential learning with supplemental credits.

A MOOC course on SWAYAM, NPTEL and Coursera can be completed with supplemental credits.

CREDIT STRUCTURE OF THE PROGRAMME (SEMESTER – IV)

(Table as per Parishishta 1 with sign of HOD and Dean)

R _____

Post Graduate Programme in University:

B. M.Sc. (Home Science – Food Processing and Preservation) (Two Years)

C. M.Sc. (Home Science – Food Processing and Preservation) (One Year)

Parishishta – 1

Exit option: PG Diploma (44 Credits) after Three Year UG Degree

Year (2 Yr PG)	Level	Sem. (2 Yr)	Major		RM	OJT/ FP	RP	Cum. Cr.	Degree
			Mandatory*	Electives (Any one)					
II	6.5	Sem- IV	Course 1 Advances in Human Nutrition (Th) (4 Cr)	Course 4 Elective 1 A. Digital Technologies, Artificial Intelligence and Robotics in Food Processing (Th) (2 Cr) B. Food Psychology and Consumer Behaviour (Pr) (2 Cr)	-	-	Course 5 Research Project (6 Cr)	22	PG Degree (after 3 Year UG)
			Course 2 Food Biotechnology (Th) (4 Cr)						
Sem – IV (For M.Sc Degree)			12	4	-	-	6	22	
Cum. Cr. (For M.Sc. Degree)			26	8	-	-	10	44	

Note: Curriculum will be enriched by extension work and educational trips for experiential learning with supplemental credits.

A MOOC course on SWAYAM, NPTEL and Coursera can be completed with supplemental credits.

Students can do a summer internship/ project (4 weeks) during the summer vacation with supplemental credits (Optional).

Year and Level	Mandatory	Elective	RM	OJT/ FP	RP	Cum. Cr.	Degree
Cum. Cr. for 1 Yr PG Degree	26	8	-	-	10	44	
Cum. Cr. for 2 Yr PG Degree	54	16	4	4	10	88	

Note: The number of courses can vary for totaling 14 Credits for Major Mandatory Courses in a semester as illustrated.

Sign of Head of the Institute

Sign of Dean

Name of the Head of the Institute:

Dr. Anuradha J. Bakshi
(I/C Principal)

Name of the Dean

Name of the Department

Foods, Nutrition and Dietetics

Name of the Faculty

Syllabus: M.Sc. (Home Science – Food Processing and Preservation)

Semester I (_____)

Level 6.0

Cumulative Credits = 22

Mandatory Courses Credits 14

Code: _____: Course 1 Credits 4 C1.

Advances in Food Science and Food Chemistry
(Th) (4 Cr)

Code: _____: Course 2 Credits 4 C2.

A. Advanced Food Microbiology
(Th) (2 Cr)
B. Advanced Food Science
(Pr) (2 Cr)

Code: _____: Course 3 Credits 4 C3.

Principles of Food Preservation
(Th) (4 Cr)

Code: _____: Course 4 Credits 2 C4.

Descriptive statistics in Home Science
(Th) (2 Cr)

Electives Course 5 Credits 4

Code: _____:

A. Traditional Indian Foods
(Th) (2 Cr)
B. Food Product Development using
Indigenous Foods (Pr) (2 Cr)

OR

Code: _____:

A. Sustainability in Food Production
(Th) (2 Cr)
B. Valorization of Food Waste through Food
Product Development (Pr) (2 Cr)

Research Methods Course 6 Credits 4

Code: _____:

Research Methods in Home Science
(Th) (4 Cr)

Syllabus:
**P.G. Diploma in Home Science – Food Processing and
Preservation**

M.Sc. (Home Science – Food Processing and Preservation)
(Semester I)

Semester I

Semester I: Mandatory Courses

M.Sc. (Home Science – Food Processing and Preservation)
Level- 6.0
(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course- 1	Advances in Food Science and Food Chemistry	Theory	4

Course Objectives:

1. To help students build an understanding of the chemistry of food components, the chemical and biochemical reactions in foods.
2. To impart systematic knowledge of basic and applied aspects of food chemistry to students.
3. To enable the students to learn fundamental and recent advances in food science.
4. To help students develop skills in industrial applications of concepts of food science in food product development.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Understand the chemistry of nutrients and additives found and used in various food groups.
CO2	Explain the functional role of nutrients and additives in influencing the properties of food.
CO3	Apply fundamentals of food chemistry in obtaining desired effect in a food product.
CO4	Analyze the effect of processing on properties of macro and micro nutrients.
CO5	Justify the use of cooking and processing techniques to enhance the organoleptic properties and shelf-life of foods.
CO6	Formulate strategies to prevent loss of nutrient values during processing.

Unit No.	Course Content	No. of Hours
I.	<p>Introduction to Major Chemical Components in Food Groups</p> <p>A. Water (i) Chemistry of water (ii) Water in food preparation and preservation, practical applications in industry</p> <p>B. Carbohydrates (i) Classification, isomerization, ring structures (ii) Properties of sugars- Hydrolysis, Caramelization, Maillard reaction (iii) Starch: Structure, functional properties - Gelatinization, pasting, syneresis, retrogradation, dextrinization, factors affecting gelatinization and gelation (iv) Overview of gums, pectic substances, pectin gels</p>	15

	<p>C. Proteins</p> <p>(i) Classification of proteins</p> <p>(ii) Properties of proteins (amphoterism, isoelectric point, water-binding capacity, hydrolysis, denaturation, coagulation, salting in, salting out, gluten complex development, gelation, texturization)</p> <p>(iii) Enzymes: Overview of exogenous enzymes (amylases, lipases, proteases) and endogenous enzymes (phenol oxidases, peroxidases, oxido-reductases, lipoxygenases), factors affecting enzyme activity</p> <p>D. Lipids</p> <p>(i) Brief classification and composition of fats, fatty acids</p> <p>(ii) Properties of Fats: crystalline nature of solid fats, polymorphism, melting points, plasticity, chemical degradation, oxidative and hydrolytic rancidity, effect of heat, chemical modifications</p> <p>(iii) Hydrogenation, Inter-esterification, Winterization</p>	
II.	<p>Chemistry of Food Groups: Plant-Based</p> <p>A. Cereals</p> <p>(i) Composition and nutritional value</p> <p>(ii) Flours, cooking cereals, breakfast cereals,</p> <p>(iii) Classes of batters and doughs</p> <p>(iv) Leavening process in baked products</p> <p>B. Fruits and Vegetables</p> <p>(i) Composition and nutritional value</p> <p>(ii) Physiochemical changes during, harvesting, post-harvesting, ripening, cooking, storage</p> <p>(iii) Organically grown fruits and vegetables</p> <p>(iv) Effect of processing on nutritive value</p> <p>C. Pulses</p> <p>(i) Composition and nutritional value</p> <p>(ii) Anti-nutritional factors in pulses</p> <p>(iii) Texturized vegetable proteins, soy isolates, beverages</p>	15
III.	<p>Chemistry of Food Groups: Animal-Based</p> <p>A. Milk and Milk Products</p> <p>(i) Composition and nutritional value</p> <p>(ii) Milk components as food ingredients (Lipid phase, protein micelles, milk salt system, whey proteins, lactose)</p> <p>(iii) Use of milk in formulated foods</p> <p>B. Meat, fish, and Poultry</p> <p>(i) Composition and nutritional value</p> <p>(ii) Rigor Mortis, Ageing, Tenderization</p> <p>(iii) Natural and induced post-mortem biochemical changes (cold shortening, thaw rigor, electrical stimulation)</p> <p>(iv) Fish – composition, spoilage</p> <p>(v) Eggs- structure and composition, cooking changes, effect of added ingredients on coagulation</p>	15
IV.	<p>Introduction to Minor Chemical Components in Food Groups:</p> <p>A. Vitamins</p> <p>Fat soluble (vitamin A, D, E and K) and water soluble (vitamins of B-complex and vitamin C)- effect of food processing, losses and stability</p> <p>B. Minerals</p> <p>Effect of food processing, losses and stability</p>	15

(ii) Overview of sodium and potassium replacers/substitutes C. Flavours (i) Molecular mechanism of flavor perception (sweet, bitter, salty, sour, umami, kokumi, pungent, cooling and astringent) (ii) Flavours from vegetables, fruits, spices, fats and oils, milk and meat products D. Pigments Overview of pigments in Animal and Plant tissues (Haeme compounds, Chlorophyll, Carotenoids, Anthocyanins, Betalins) E. Additives Overview and examples of: Buffer systems and salts, chelating agents, Antioxidants, Antimicrobials, Fat replacers, sweeteners, Masticatory substances, Firming texturizers, Clarifying agents, bleaching agents, Flour improvers, anti-caking agents, Gases and propellants	
Total hours	60

References:

Vacklavick, V. and Christian, E. (2003). *Essentials of Food Science*. New York: Kluwer Academic/ Plenu Publisher.

Rick Parker (2003). *Introduction to Food Science*, New York: Delmar Thomson Learning

Srilakshmi, B (2018). *Food Science* (7th ed). New Delhi: New Age International Publishers

McWilliams, M (2007). *Foods: Experimental Perspectives* (5th ed), New Jersey: Macmillan Publishing Co.

Scottsmith and Hui Y.H (Editors) (2004) *Food Processing – Principles and Applications* London Blackwell.

Srilakshmi, B (2021). *Nutrition Science* (7th ed). New Delhi: New Age International Publishers

** All new journals related to Food Science**

Evaluation:

4 Credits 100 marks

Continuous Internal Evaluation (50%):	Marks
Development of digital content on relevant topic (PowerPoint, infograph/ animation video)	30
Class test/ Quiz	10
Group Discussion/ Debate	10
Total	50

Semester-end Examination (50%):	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from Unit 3	10
Question 4 from Unit 4	10
Question 5 from multiple units	10
Total	50

M.Sc. (Home Science – Food Processing and Preservation)
Level- 6.0
(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course- 2A	Advanced Food Microbiology	Theory	2

Course Objectives:

1. To help students develop an advanced understanding of physiological processes of microorganisms associated with the food continuum.
2. To equip students with skills to identify organisms identified as leading causes of foodborne disease.
3. To facilitate in the students, the competencies of implementing food safety and quality norms in food processing units and create awareness in communities of the same.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Familiarize with the microorganisms relevant in food systems– microorganisms used in food processing.
CO2	Explain the classification of microorganisms and the factors that affect growth and activity of microorganisms in food.
CO3	Evaluate the difference between food intoxication and food infections and their relevance in outbreaks of food illnesses.
CO4	Review and analyse the conventional and modern techniques used for identification of microorganisms in food.
CO5	Justify the necessity for implementing food safety and quality control norms in food processing units to prevent microbial hazards.
CO6	Create a knowledge-base for awareness on spread and control of foodborne pathogens amongst stakeholders.

Unit No.	Course Content	No. of Hours
I.	<p>A. Review of Food Microbiology</p> <p>(i) Microbial flora in common food groups (cereals, pulses, milk and milk products, meat, poultry, fish, eggs, vegetables, fruits, sugars and fats)</p> <p>(ii) Factors affecting microbial growth and control in foods: intrinsic factors, extrinsic factors, implicit factors</p> <p>C. Foodborne Illnesses</p> <p>(i) Produce as a source of foodborne disease</p> <p>(ii) Mechanisms of microbial survival in the food chain</p> <p>(iii) Epidemiology and etiology of food-borne disease (infections and intoxications)</p>	15

II.	A. Microbial Food Safety and Quality Control (i) Food microbiology/safety history, disease, trends and emerging pathogens (ii) New and emerging technologies for the reduction of pathogenic and spoilage organisms in food (iii) Food production plant sanitation and hygiene practices for microbial control (iv) Conventional and rapid methods of food analysis -Limitations of classical methods -Rapid Microbiological Methods (RMM): manual, semi-automated and automated -Genetics-based diagnostic and identification systems (gene probes and PCR)- Predictive microbiology models and microbial risk assessment	15
Total hours		30

References:

- Frazier, W.C., and D.C. Westhoff. (2017). *Food Microbiology* (5th ed). McGraw-Hill, Inc., New York.
- Jay, James M.; Loessner, Martin J.; Golden, David A. (2005). *Modern Food Microbiology* (7th ed). Springer.
- Motarjemi Y; Adams, Martin. *Emerging Foodborne Pathogens* (2006). Woodhead Publishing.
- Lund, B. M.; Baird-Parker, T. C.; Gould, G. W. *Microbiological Safety and Quality of Food*, Volumes 1-2. Springer - Verlag.
- Blackburn, C.W.; McClure, P.J. (2002). *Foodborne Pathogens - Hazards, Risk Analysis and Control*. Woodhead Publishing.
- Adams, M.R. and Moss, M.O. (2005) *Food Microbiology* (1st ed). New Age International (P) Limited, Publishers, New Delhi.
- Banwant G,J, (2002) *Basic Food Microbiology* (2nd ed). Chapman and Hall Inc., New York.
- Journals: Applied and Environmental Microbiology; Comprehensive Reviews in Food Science and Food Safety; International Journal of Food Microbiology; Food Control; Food Microbiology; Journal of Applied Microbiology; Journal of Food Protection; Journal of Food Science.

Evaluation:

2 Credits 50 Marks

Continuous Internal Evaluation (50%):	Marks
PowerPoint, oral and written presentation of literature review with class discussion	10
Demonstration of awareness on foodborne illness among students/ professionals/ community through group street play	10
Class Test	5
Total	25

Semester-end Examination (50%):	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from both units	5
Total	25

M.Sc. (Home Science – Food Processing and Preservation)
Level- 6.0
(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course- 2B	Advanced Food Science	Practical	2

Course Objectives:

1. To help students understand principles of food science involved in bringing changes in foods.
2. To equip students with skills to observe and identify physical and chemical changes underlying the preparation of diverse foods and to create products applying principles of Food Science.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Recall the basics of food science and chemical interactions occurring in foods.
CO2	Describe the functional and nutritional role of each ingredient during recipe development.
CO3	Apply the principles of food chemistry and food science in recipe development.
CO4	Analyze the effect of physical and chemical parameters on the properties of cooked products.
CO5	Critique the theories of food science on studying the visual and textural attributes of cooked products.
CO6	Design experimental strategies to demonstrate the application of scientific principles in various processed foods.

Unit No.	Course Content	No. of Hours
I.	<p>A. Solutions and Ice Crystallisation Effect of formulation and procedure on crystal size of frozen desserts</p> <p>B. Cereals and Flours (i) Comparison of different cereals for water absorption and consistency, comparison of- different methods of cooking rice among different varieties of rice (ii) Gelatinization of Starch (different types), starches as thickening agents (potato, corn and other)</p> <p>C. Sugar Cookery (i) Stages of sugar cookery (ii) Crystalline and non-crystalline candies</p> <p>D. Temporary and Permanent Emulsions Effect of Stabilizers and Emulsifiers in salad dressings, comparisons of low fat and high fat French dressing, preparation and comparison of Mayonnaise with variations (with and without egg)</p>	30

	<p>E. Effect of Different Conditions on Properties of Proteins e.g. Milk</p> <p>(i) Effect of acids (citric acid, lactic acid and acetic acid) on coagulation of milk proteins</p> <p>(ii) Effect of fat content, pH stabilizers in cream and whipped toppings</p> <p>(iii) Effect of gums on gelation</p> <p>(iv) Difference between natural and processed cheese</p>	
II.	<p>A. Principles that Maintain High Quality Fried Foods</p> <p>(i) Smoke point of different fats and oils</p> <p>(ii) Factors affecting fat absorption: temperature, formulation on fat absorption, coating and binding agents</p> <p>(iii) Comparison of texture, flavor and mouth-feel of food products using fat substitutes</p> <p>B. Examination of properties of egg/meat</p> <p>(i) Denaturation and Coagulation of egg</p> <p>(ii) Egg white foams- volume and stability</p> <p>(iii) Effect of acid and alkalis on meat/poultry</p> <p>C. Factors Affecting Gelatin Gel</p> <p>Temperature of liquid, proteolytic enzymes, whipping</p> <p>D. Factors Affecting Vegetable Pigments</p> <p>Temperature, Acid, Alkalis</p> <p>E. Pectin Gel</p> <p>Determination of pectin content, development of a fruit jam using natural and commercial pectin</p>	30
	Total hours	60

References:

- Manay, N.S. and Shadaksharaswamy, M. (2021). *Food Facts and Principles* (5th ed) New Age International Publishers. New Delhi.
- Jameson K. (1998). *Food Science – A Laboratory Manual*, New Jersey:Prentice Hall Inc.
- Lawless, H. and Heymann, H. (1998). *Sensory Evaluation of Food – Principles and Practices*, Kluwer Academic/Plenum Publishers. USA: CRC Press Inc.
- McWilliam, M. (2001). *Foods – Experimental Perspectives* (4th ed.). New Jersey: Prentice Hall Inc.
- Weaver, C. (1996). *Food Chemistry Laboratory – A manual for Experimental Foods*.
- Damodaran S., Parkin KL. and Fennema O.R. *Fennema's Food Chemistry* (4th ed). Florida: CRC Press.

Evaluation:

2 Credit 50 Marks

Continuous Internal Evaluation (50%):	Marks
Journal	5
Drafting of recipe protocol	10
Execution and presentation	10
Total	25

Semester-end Examination (50%):	Marks
Planning and execution of recipe as per given topic and viva voce	25
Total	25

M.Sc. (Home Science – Food Processing and Preservation)
Level- 6.0
(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course- 3	Principles of Food Preservation	Theory	4

Course Objectives:

To help, guide and support students to:

1. Understand the principles of food preservation.
2. Learn important methods used in food preservation to ensure food quality.
3. Study and analyse the emerging techniques employed by food industry and design methodologies for preservation.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Describe the techniques used in extending the shelf life of foods.
CO2	Understand the principles of food preservation.
CO3	Apply the knowledge of principles of food preservation to select appropriate food processing techniques techniques.
CO4	Analyse the advantages and limitations of various methods used for food preservation.
CO5	Evaluate the various techniques used and judge their suitability for preservation of food commodities.
CO6	Design methodologies for shelf life extension of food.

Unit No.	Course Content	No. of Hours
I.	A. Principles of Food Preservation (i) Meaning, mode of action and changes in foods B. Use of High temperature (Heat preservation) (i) Moist heat methods (ii) Dry heat methods (iii) Blanching (iv) Dehydration (v) Concentration (vi) Canning and retorting (vii) Commercial sterilization (viii) Pasteurization	15

	<p>C. Use of Low Temperatures</p> <p>(i) Cold Preservation: Freezing and Refrigeration- Air freezing</p> <p>(ii) Indirect contact freezing</p> <p>(iii) Immersion freezing</p> <p>(iv) Dehydro-freezing</p> <p>(v) Cryo-freezing</p> <p>(vi) Changes in foods during refrigeration and frozen storage</p>	
II.	<p>A. Use of dehydration and Concentration</p> <p>(i) Benefits and factors affecting heat and mass transfer</p> <p>(ii) Physical and chemical changes during dehydration and concentration</p> <p>(iii) Methods and techniques used in dehydration (Air convection, drum driers and vacuum driers, freeze driers)</p> <p>(iv) Use of various evaporators for concentration of foods</p> <p>B. Use of Fermentation</p> <p>(i) Benefits and mechanisms of fermentation</p> <p>(ii) Fermented food products- Beer, Wine, Soya sauce, Cheese, Soya bean products</p> <p>(iii) Microbial vs Industrial Fermentation</p>	15
III.	<p>A. Use of Food Additives</p> <p>(i) Broad classes</p> <p>(ii) Intentional and unintentional food additives</p> <p>B. Use of Ionizing radiation and microwave heating</p> <p>(i) Ionizing radiations and sources</p> <p>(ii) Units of radiation</p> <p>(iii) Radiation effects</p> <p>(iv) Mechanism of microwave heating</p> <p>(v) Application of radiation and microwave technology</p> <p>C. Preservation by High Osmotic Pressure</p>	15
IV.	<p>A. Traditional Methods of Food Preservation</p> <p>(i) Smoking</p> <p>(ii) Sun drying</p> <p>(iii) Pickling/ Salting</p> <p>(iv) Fermentation</p> <p>B. Recent advances in food preservation</p> <p>(i) Pulse electric field</p> <p>(ii) Hurdle technology</p> <p>(iii) Infra-red heating</p> <p>(iv) High Pressure Processing</p> <p>(v) Use of Natural compounds (antioxidants, antimicrobials)</p>	15
	Total hours	60

References:

Manay, N. S. and Sharaswamy, S. M. (2008). Foods: Facts and Principles New Delhi: New Age International Publishers.

McWilliams, M (2017). Foods: Experimental Perspectives 8th Ed, New Jersey: Macmillan Publishing Co.

Potter, N. N. and Hutchkiss, J. H. (2012). Food Science, 5th Ed, New Delhi: CBS Publishers and Distributors.

Subbulakshmi, G and Udipi, S. A. (2006). Foods Processing and Preservation, New Delhi: New Age International (P) Ltd. Publishing.

Vacklavick, V. and Christian, E. (2020). Essentials of Food Science. New York: Kluwer Academic/ Plenum Publisher.

Research articles from journals related to Food Preservation.

Evaluation:

4 Credits 100 marks

Continuous Internal Evaluation (50%):	Marks
Literature review on emerging technologies in Food preservation	20
Group discussion/ debate	15
Class Test	15
Total	50

Semester-end Examination (50%):	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from Unit 3	10
Question 4 from Unit 4	10
Question 5 from multiple units	10
Total	50

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(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 4	Descriptive Statistics in Home Science	Theory	2

Course Objectives:

1. To help students value the sine qua non role of statistics in quantitative research.
2. To enable in students the skills in selecting, computing, interpreting and reporting descriptive statistics.
3. To facilitate comprehension of elementary concepts in probability.
4. To introduce students to a specialised statistical software such as SPSS.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Identify the level of measurement of a variable and the corresponding suitable statistical technique to describe this variable.
CO2	Identify, differentiate between, evaluate, and select different descriptive statistical techniques to numerically summarise data.
CO3	Identify, differentiate between, evaluate, and select different descriptive statistical techniques to graphically summarise data.
CO4	Acquire necessary knowledge and skills to design and conduct descriptive research studies.
CO5	Use SPSS for data entry, data management, and descriptive statistics effectively.

Unit No.	Course Content	No. of Hours
I.	<p>A. Introduction and overview to statistics</p> <p>(i) Role of statistics in (quantitative) research</p> <p>(ii) Definition/changing conceptions</p> <p>(iii) Prerequisite concepts in mathematics (e.g., basic algebra, properties of the summation sign)</p> <p>B. Descriptive Statistics for summarizing ratio level variables</p> <p>(i) Frequencies and percentages</p> <p>(ii) Computing an average/measure of a central tendency</p> <p>Mean, median, mode(s)</p> <p>Contrasting the mean vs. median</p> <p>Computing an average when there are outliers or extreme values in the data set</p> <p>Robust measures of the center (5% trimmed mean; M estimators)</p> <p>Quartiles and percentiles</p> <p>(iii) Computing a measure of variability or dispersion</p> <p>Why? (inadequacy of the mean)</p> <p>Minimum value and maximum value</p> <p>Range</p> <p>Interquartile range</p> <p>Variance and standard deviation</p> <p>(iv) Discrete and continuous variables</p> <p>(v) Histograms and line graphs</p>	15

II	<p>A. Descriptive Statistics for summarizing nominal, ordinal and interval level variables</p> <p>B. Using specialised software such as SPSS</p> <p>(i) Data Entry (ii) Data Management (iii) Descriptive Statistics</p> <p>C. Probability</p> <p>(i) Definition (ii) Role of probability in research and statistics (iii) Elementary concepts in probability Sample space, experiment, event/outcome/element of the sample space Equally likely outcomes and the uniform probability model Stabilization of the relative frequency</p>	15
	Total hours	30

References:

- Bhattacharyya, G.K., and Johnson, R.A. (1977). *Statistical concepts and methods*. John Wiley. (classic).
- Jackson, S. L. (2012). *Research methods and statistics: A critical thinking approach* (4th ed.). Wadsworth Cengage Learning.
- Johnson, R. A., and Bhattacharyya, G. K. (2019). *Statistics: Principles and methods* (8th ed.). John Wiley.
- Martin, W. E., and Bridgmon, K. D. (2012). *Quantitative and statistical research methods*. Jossey-Bass.
- Kachigan, S. K. (1986). *Statistical analysis: An interdisciplinary introduction to univariate and multivariate methods*. Radius Pr
- Kerlinger, F. N. and Lee, H. B. (2000). *Foundations of behavioral research*. Harcourt
- Wheelan, C. J. (2014). *Naked statistics: Stripping the dread from the data*. W.W. Norton

Evaluation:

2 Credits 50 marks

Continuous Internal Evaluation:	Marks
Written Short Quizzes	10
SPSS data entry and descriptive statistical analysis assignment	5
Problem-solving Exercises (in pairs or individually) and Practice Sums (individually)	10
Total	25

Semester-end Examination	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from multiple units	5
Total	25

Semester I: Elective Courses

M.Sc. (Home Science – Food Processing and Preservation)
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Semester- I

Major (Elective Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 5- Elective 1A	Traditional Indian Foods	Theory	2

Course Objectives:

1. To help students comprehend the origin and history of different foods and food habits and the impact of culture on them.
2. To understand the similarities and differences in meal patterns across India.
3. To help students attain knowledge of different food ingredients indigenous to India and the significance of incorporating them in modern food products.
4. To guide students to formulate a plan for incorporation of traditional Indian foods into newer food products.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Familiarize themselves with inception and development of agricultural practices and settlement that gave rise to variations in food habits.
CO2	Explain the impact of culture on food in the terms of cooking, meal patterns and social occasions.
CO3	Evaluate the traditional techniques used for processing of different agricultural commodities, milk and milk products.
CO4	Compare the traditional and modern foods with respect to cost, safety, nutritional composition and bioactive content.
CO5	Critique the indigenous foods in India and their health benefits in traditional context.
CO6	Formulate a plan for merger of indigenous Indian foods and modern food processing techniques to provide the food product market with unique products.

Unit No.	Course Content	No. of Hours
I.	<p>A. Significance of Food in History and Culture</p> <p>(i) Foraging, advent of agriculture, horticulture and pastoralization</p> <p>(ii) Impact of food on culture: variability, diversity, customs and traditions</p> <p>(iii) Heterogeneity within cultures and specific social contexts (festivals, celebrations, mourning, fasting, Kosher, Halal, etc.)</p> <p>B. Traditional food patterns</p> <p>(i) Traditional breakfast, meal and snack foods of different regions of India</p> <p>(ii) Typical regional foods that have become pan-Indian and global</p> <p>(iii) Traditional fermented foods, pickles, preserves, beverages, snacks</p>	15

	and desserts (iv) Over view of intellectual property rights in traditional foods	
II.	<p>A. Traditional Methods of Food Processing</p> <p>(i) Traditional post-harvest techniques used at house-hold level- milling grains, extraction of edible oil</p> <p>(iii) Traditional methods for processing of paneer, butter and ghee</p> <p>(iv) Traditional ingredients used for special ailments</p> <p>(v) Traditional foods and ingredients used to improve nutritional status and boost immunity in physiological conditions- pregnancy, lactation, infant feeding and weaning (ARF), geriatrics.</p> <p>(v) Commercial production of traditional foods- case study on types of traditional foods currently manufactured, market turnover, brands and companies involved, marketing strategies</p> <p>B. Development of Food Product Using Indigenous Ingredients</p> <p>(i) Crops that are indigenous to Indian sub-continent- properties, economic feasibility, nutritive value and safety</p> <p>(ii) Need for development of more food products that incorporate indigenous ingredients</p> <p>(iii) Energy and environmental impact of indigenous foods</p>	15
	Total hours	30

References:

- Sen, Colleen T. (2005). *Food Culture in India*. Greenwood Press.
- Davidar, Ruth N. (2001). *Indian Food Science: A Health and Nutrition Guide to Traditional Recipes*. East West Books.
- Vaidya, A., Smith. (2011). *Ayurvedic Nutrition*. Motilal Banarsi Dass Publishers Pvt. Ltd, Delhi.
- Matz, S.A. (2018). *The Chemistry and Technology of Cereals as Food and Feed*. (Kindle ed.). CBS Publishers and Distributors Pvt. Ltd, New Delhi.
- Steinkrus, K.H. (2018). *Handbook of Indigenous Fermented Foods*. CRC Press.
- Srilakshmi, B (2018). *Food Science (7th ed)*. New Delhi: New Age International Publishers.

Evaluation:

2 Credits 50 marks

Continuous Internal Evaluation (50%):	Marks
Literature review and PowerPoint presentation on health benefits of any one indigenous ingredient used in India	15
Survey on the traditional food items relevant to the culture/ region of the student and poster presentation on the same	10
Total	25

Semester-end Examination (50%):	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from both units	5
Total	25

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Semester- I

Major (Elective Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 5- Elective 1B	Food Product Development using Indigenous Foods	Practical	2

Course Objectives:

1. To enable students to apply the principles of food science in the development of innovative indigenous food products.
2. To guide students in identification of a suitable packaging material, label and storage conditions for the developed product.
3. To facilitate students in designing a standardized process-flow and crafting unique marketing strategies for sale of indigenous foods.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Understand the fundamental steps involved in developing indigenous food products.
CO2	Explain the role of different ingredients in enhancing the nutritional value of indigenous foods.
CO3	Apply food processing techniques to create indigenous food prototypes.
CO4	Analyze the impact of processing methods on the preservation of bioactive compounds found in indigenous ingredients.
CO5	Critique the sensory evaluation methods to assess the palatability of indigenous food products.
CO6	Design innovative indigenous food products that merge traditional ingredients with modern technology.

Unit No.	Course Content	No. of Hours
I.	<p>A. Concepts in Food Product Development</p> <p>(i) Hypothetical proposal for new product development (ii) Enhancement of nutritive value of foods (iii) Understanding weights and measures, metric conversions (iv) Role of ingredients (v) Use of Ready Reckoners /Exchange list/ NIN Food database/ USDA Food Database (vi) Construction of Recipes (Standard, File Card format, Picture recipes) (vii) Waste Utilisation, Cost Effectiveness, Value Addition</p> <p>A. Sensory Evaluation of Foods</p> <p>(i) Threshold concentrations of primary tastes (ii) Effect of temperature on taste (iii) Identification of samples through Difference, Descriptive and Affective testing</p>	30

	(iv) Determination of sensory evaluation methods for evaluating quality (v) Developing score card as an evaluation tool	
II.	<p>A. Indigenous Food Product Formulation Laboratory Trials</p> <p>(i) Product development/ value addition using indigenous foods- any one of the following product categories- baked foods, yoghurt, beverage, salad dressing, fermented food, preserves, pickle, desserts OR any other relevant product</p> <p>(ii) Development of the formula (Modification of Home based recipes for Innovation)</p> <p>(iii) Preparing a flow chart indicative of the operational processes</p> <p>(iv) Understanding the concept of scale up</p> <p>(v) Identifying suitable packaging material</p> <p>(vi) Shelf life studies in various altered conditions</p> <p>B. Marketing Exercise</p> <p>(i) Business analysis and marketing strategy</p> <p>(ii) Launching of the product</p> <p>(iii) Evaluation of product acceptability on the basis of cost effectiveness and other nutritive parameters through survey</p>	30
	Total hours	60

References:

- deMan J. (2007). *Principles of Food Chemistry* (3rd ed.). Springer.
- Jameson K. (1998). *Food Science – A Laboratory Manual*. New Jersey: Prentice Hall Inc.
- McWilliam, M. (2001). *Foods – Experimental Perspectives*. (4th Ed.). New Jersey: Prentice Hall Inc. USA: CRC Press Inc.
- Meilgard (1999). *Sensory Evaluation Techniques*. (3rd ed.). CRC Press LLC.
- Pomeranz Y and Meloan CE (2002). *Food Analysis – Theory and Practice*. CBS Publishers and Distributors, New Delhi.
- Rao E. S. (2013). *Food Quality Evaluation*. Variety Books.
- Weaver, C. (1996), *Food Chemistry Laboratory – A manual for Experimental Foods*.

Evaluation:

2 Credits 50 marks

Continuous Internal Evaluation (50%):	Marks
Journal	5
Development of a new food product in groups (Writing the research proposal for development new product, standardization, packaging, labeling, marketing and sales)	20
Total	25

Semester-end Examination (50%):	Marks
Questions based on concepts of food product development and sensory evaluation from both units.	20
Viva-voce examination	5
Total	25

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Semester- I

Major (Elective Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 5- Elective 2A	Sustainability in Food Production	Theory	2

Course Objectives:

1. To generate in students the awareness about the environmental impact of food industry waste and the need for sustainable practices in food process operations.
2. To help students understand the various techniques employed by food industry for treating food waste.
3. To enable students to create novel food products through valorization of food waste.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Understand physical and chemical composition of wastes generated in food processing operations.
CO2	Describe regulatory aspects and environmental impact of food wastes.
CO3	Evaluate the working and design of Effluent Treatment Plant (ETP).
CO4	Analyze the functional elements of solid and liquid waste management.
CO5	Critique the methods used in primary, secondary and tertiary treatment of food wastes.
CO6	Formulate solutions for reduction in food wastes and sustainable use of resources from entry point till exit point.

Unit No.	Course Content	No. of Hours
I.	<p>A. Food waste generated by different sectors of food industry: (i) Cereals Grains, Pulses, Fruits and Vegetables, Oilseeds processing (ii) Dairy, Meat, Fish & Poultry processing</p> <p>B. Environment Impact of food waste generated by various sectors of the food industry (i) Food industry waste and carbon footprint (ii) Environmental Regulations</p> <p>C. Sustainable operational processes used by the food industry to minimize waste generation (i) Sustainable practices used in farms, manufacture, supply chain and distribution.</p>	15

II.	A. Food Waste Treatment (i) Screening, sedimentation, skimming, floatation, coagulation & flocculation, filtration, adsorption, membrane separation, ion exchange (ii) Anaerobic & aerobic digestion of organic wastes B. Value added products from food waste (i) Extraction Technologies (ii) Bioactive compounds and other products from food waste C. Sustainable strategies for minimization of food waste at household and local level (i) Composting (ii) Food bank initiatives	15
	Total hours	30

References:

- Norman, G. Marriott. and Robert, B. Gravani. (2018). *Principles of Food Sanitation*,(6th ed). Springer.
- Cybulska G. (2000). *Waste Management in the Food Industry: An Overview*; Publisher: Campden and Chorleywood Food Research Association.
- Green, J.H. and Kramer A. (1979). *Food Processing Waste Management*; AVI Publishing
- Ioannis S. Arvanitoyannis. (2007). *Waste management for the Food Industry*; Publisher: Academic Press.
- Jha S. N. (2004). *Dairy and Food Processing Plant Maintenance: Theory and Practice*; International Book Distribution (Publication Division) Company, Lucknow.
- Recent research articles reported in various research journals

Evaluation:

2 Credits 50 marks

Continuous Internal Evaluation (50%):	Marks
Quiz	5
Review of literature on environmental impact of food waste	10
Presentation of case studies on valorization of food waste by food industries	10
Total	25

Semester-end Examination (50%):	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from both units	5
Total	25

M.Sc. (Home Science – Food Processing and Preservation)
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Semester- I

Major (Elective Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 5- Elective 2B	Valorization of Food Waste through Food Product Development	Practical	2

Course Objectives:

1. To build the students' ability to apply the knowledge of waste management by re-utilisation of food waste into value-added products.
2. To facilitate skill building in the students through practical hands-on training on treatment of food waste in food industries.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO No.	Course Outcome
CO1	Understand the principles of food waste management.
CO2	Explain the techniques used in treatment of food waste to ensure retention of maximum resources.
CO3	Interpret the impact of utilisation of by-products of food processing on value-addition of products.
CO4	Utilize scientific understanding to address challenges in developing and effective value-added product using food waste.
CO5	Evaluate the functional attributes of various by-products of food processing and scope for their use.
CO6	Develop novel value-added products using by-products of food processing and determine the utility of the product.

Unit No.	Course Content	No. of Hours
I.	<p>A. Student-led Project Work: Re-cycling and utilisation of waste/ by-product from food processing/ agro industry into a value-added product: (i) Identification of suitable by-product: Bagasse, chitin, fruit/ vegetable peels, oil-seed cakes, husks of cereals and pulses etc. (ii) Justification and objectives for creation of selected value-added product (iii) Standardisation of the formulation and protocol (iv) Development of product (v) Testing of efficacy of the product (vi) Report and demonstration</p>	30

II.	A. Visit to waste treatment plant in food processing unit and reporting on the treatment procedures carried out there B. Case studies on Food Bank Initiatives	30
	Total Contact Hours	60

References:

Food Waste to Valuable Resources: Applications and Management. (2020). Netherlands: Elsevier Science.

H. Panda (2011). *The Complete Book on Managing Food Processing Industry Waste*. Asia Pacific Business Press Inc.

Valorization of Agri-Food Wastes and By-Products: Recent Trends, Innovations and Sustainability Challenges. (2021). Netherlands: Elsevier Science.

Evaluation:

2 Credits 50 marks

Continuous Internal Evaluation (50%):	Marks
Visit to effluent treatment plant (ETP) in food processing unit and submission of detailed report	5
Evaluation of project on by-product utilization of food processing and report submission	20
Total	25

Semester-end Examination (50%):	Marks
Development of recipe for specific target population by incorporation of given food waste sample.	20
Viva Voce	5
Total	25

Semester I: Research Methods in Home Science

M.Sc. (Home Science – Food Processing and Preservation)
Level- 6.0
(Under NEP)

Semester- I

Major (Mandatory Course)

Course Code	Title of the Course	Th/Pr	Credits
Course 6	Research Methods in Home Science	Theory	4

Course Objectives:

1. To build in students appreciation for high quality research in their specialisation and allied areas.
2. To help students master the knowledge and skills needed in conducting specialisation-specific and interdisciplinary research relevant to the multiple disciplines under the umbrella of Home Science.
3. To promote academic, research and professional ethics in students.
4. To introduce students to principles of good scientific writing.

Course Outcomes:

On successful completion of the course, the student will be able to:

CO1	Acquire heightened appreciation for high quality research in their specialisation and allied areas.
CO2	Identify, differentiate between, evaluate, and select different sampling techniques and research designs for particular research aims.
CO3	Formulate a research proposal on a worthwhile topic in their discipline, as also on interdisciplinary topics.
CO4	Abide with ethical guidelines for research.
CO5	Develop necessary knowledge and skills to contribute to their discipline through conducting primary and original research on socially relevant, green, and high priority topics.

Unit No.	Course Content	No. of Hours
I.	<p>A. Introduction and overview</p> <p>(i) What is a research?</p> <p>(ii) Importance of research in general, and in each specialisation of Home Science and allied areas; illustration of research in each specialisation of Home Science and allied areas</p> <p>(iii) Steps in the research process</p> <p>(iv) Qualitative versus quantitative research</p> <p>(v) Objectivity and subjectivity in scientific inquiry: Premodernism, modernism, and postmodernism</p> <p>B. The beginning steps in the research process</p> <p>(i) Identifying broad areas of research in a discipline</p> <p>(ii) Identifying interest areas; using multiple search strategies</p> <p>(iii) Prioritising topics; specifying a topic; feasibility</p> <p>(iv) Review of literature/scholarly argument in support of study</p> <p>(v) Specifying research objectives/hypotheses/questions</p>	15
II.	<p>A. Variables</p> <p>(i) Definition</p> <p>(ii) Characteristics</p> <p>(iii) Types</p> <p>(iv) Levels of measurement</p> <p>B. Measurement</p> <p>(i) Conceptual definitions and operational definitions</p> <p>(ii) Types of validity and reliability in quantitative research</p> <p>C. Data entry in quantitative research</p> <p>(i) Codebook and mastersheet</p> <p>(ii) Creating data files and data management</p>	15
III.	<p>A. Sampling techniques in quantitative research</p> <p>(i) Probability and nonprobability sampling methods in current use/examples from current research</p> <p>(ii) Issues with regard to sampling techniques</p> <p>B. Research designs in quantitative research</p> <p>Distinguishing between the following research designs; and, selecting research designs that are congruent with one's research purpose.</p> <p>(i) Experimental, quasi-experimental, and pre-experimental research designs; correlational research design</p> <p>Inferring causality, internal validity, external validity</p> <p>(ii) Epidemiological research designs (cross-sectional, cohort, and case-control studies); developmental research designs (cross-sectional, longitudinal, sequential research designs; additive, mediator and moderator models; cross-lagged panel analyses); survey and market research designs; meta-analysis</p> <p>(iv) Exploratory, descriptive, and explanatory designs</p> <p>(i) Mixed methods research designs</p>	15

IV.	<p>A. Qualitative research methods</p> <ul style="list-style-type: none"> (i) Ideology/worldview of the qualitative researcher (ii) Research designs in qualitative research (iii) Sampling techniques in qualitative research (iv) Data collection methods in qualitative research (v) Data analytic strategies in qualitative research (vi) Reporting of results in qualitative research <p>B. Scientific writing</p> <ul style="list-style-type: none"> (i) Distinguishing scientific writing from popular and literary writing styles (ii) Publication guidelines (APA7); characteristics/principles of scientific writing; examples of good scientific writing (iii) Writing a research proposal/research grant; seeking funding (iv) Reporting statistical findings in text <p>C. Ethics</p> <ul style="list-style-type: none"> (i) In academia (ii) In research in general (iii) In research with human participants (Nuremberg Code, Belmont Report, ICMR Guidelines) (iv) In research with animal subjects 	15
	Total hours	60

References:

American Psychological Association. (2019). *Publication manual of the American Psychological Association* (7th ed.). APA

Bhattacharyya, G.K., and Johnson, R.A. (1977). *Statistical concepts and methods*. John Wiley. (classic)

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage

Denzin, N. K., and Lincoln, Y. S. (2011). *The Sage handbook of qualitative research*. Sage

Fraenkel, J. R., and Wallen, N. E. (2006). *How to design and evaluate research in education* (6th ed.). McGraw-Hill

Jackson, S. L. (2012). *Research methods and statistics: A critical thinking approach* (4th ed.). Wadsworth Cengage Learning

Johnson, R. A., and Bhattacharyya, G. K. (2019). *Statistics: Principles and methods* (8th ed.). John Wiley

Martin, W. E., and Bridgmon, K. D. (2012). *Quantitative and statistical research methods*. Jossey-Bass

Merriam, S. B., and Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation* (4th ed.). John Wiley

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage

Kerlinger, F. N. and Lee, H. B. (2000). *Foundations of behavioral research*. Harcourt

Leong, F.T.L. and Austin, J. T. (Eds.) (2006). *The psychology research handbook: A guide for graduate students and research assistants* (2nd ed.). Sage

Rubin, A., and Babbie, E. R. (2011). *Research methods for social work* (7th ed.). Thomson, Brooks/Cole

Evaluation:

4 credits 100 marks

Continuous Internal Evaluation:	Marks
Written Short Quizzes	10
Short Exercises	10
Group project to be completed in pairs or threes: Formulating a Research Proposal on a High Priority Topic relevant to each student group's specialisation; students can opt to work on interdisciplinary research project proposals with team members from more than one specialisation of Home Science	30
Total	50

Semester-end Examination	Marks
All questions are compulsory with internal choice	
Question 1 from Unit 1	10
Question 2 from Unit 2	10
Question 3 from Unit 3	10
Question 4 from Unit 4	10
Question 5 from multiple units	10
Total	50

Letter Grades and Grade Points

Semester GPA/Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result
9.00-10.00	90.0-100	O (Outstanding)
8.00-<9.00	80.0-<90.0	A+ (Excellent)
7.00-<8.00	70.0-<80.0	A (Very Good)
6.00-<7.00	60.0-<70	B+ (Good)
5.50-<6.00	55.0-<60.0	B (Above Average)
5.00-<5.50	50.0-<55.0	C (Average)
4.00-<5.00	40.0-<50.0	P (Pass)
Below 4.00	Below 40	F (Fail)
Ab (Absent)		Absent

Team for Creation of Syllabus

Name	College Name	Signature
Dr. Anuradha J. Bakshi I/C Principal	College of Home Science Nirmala Niketan	
Mrs. Vibha Hasija Head of the Department	College of Home Science Nirmala Niketan	
Dr. Minelly Rodrigues Assistant Professor	College of Home Science Nirmala Niketan	
Mrs. Fatima Nevrekar Assistant Professor (Temporary: Self-financed Faculty)	College of Home Science Nirmala Niketan	

Sign of Head of the Institute:

Sign of Dean:

Name of the Head of the Institute:

Dr. Anuradha J. Bakshi
(I/C Principal)

Name of the Dean

Name of the Department

Foods, Nutrition and Dietetics

Name of the Faculty

Appendix B

Justification for M.Sc. (Home Science - Food Processing and Preservation)

1.	Necessity for starting the course:	<p>The Master of Home Science in Food Processing and Preservation Programme has been meticulously designed following the guidelines of the National Education Policy (NEP) 2020.</p> <p>Food science and processing is a sector with tremendous scope for growth and is among the most rapidly expanding areas of science and technology. Increase in world population has resulted in an increase in the demand for food. Improvement in education and better employment options have triggered the need to provide the market with convenience foods that meet optimal quality standards along with being nutritionally well-balanced. On the other hand, there is also the rising issue of wastage and spoilage of agricultural produce in huge amount. To address these queries and provide smart solutions, it is the need of the hour to have professionals in food processing and preservation who are equipped with the finest knowledge and skills to improve food production and tackle food-safety and food-wastage related problems.</p> <p>The programme in M.Sc. (Home Science – Food Processing and Preservation) has been designed to equip students with a broad foundation of, as well as comprehensive knowledge in advanced concepts in food processing, basics of nutrition, food safety, food quality assurance, food analysis and food microbiology. The elective courses and practical components focus on cultivating crucial skills and enhancing employability.</p> <p>This education is pivotal for nurturing a professional workforce in food processing businesses and their practical implementations within communities. Graduates of the programme are equipped to contribute effectively to food business operations, approaching their work with a scientific perspective and actively participating in innovative research projects. This M.Sc. programme's aim is to nurture food professionals who can make meaningful contributions in both practical and research domains by fostering a holistic understanding of food processing and preservation and its real-world applications within communities.</p>
2.	Whether the UGC has recommended the course:	YES

3.	Whether all the courses have commenced from the academic year 2023-2024:	Master's Course (Home Science – Food Processing and Preservation) shall commence from the academic year 2023-2024. Semester I and Semester II shall commence from the academic year 2023-2024. Semester III and Semester IV shall commence from the academic year 2024-2025.
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available?	The course is SELF-FINANCED. Adequate eligible faculty members are recruited each year.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	Two Years Full Time (Four Semesters) It is NOT possible to compress the course.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	Intake Capacity: 20 Number of admissions given in the current academic year: Ongoing
7.	Opportunities of Employability/ Employment available after undertaking these courses:	The course emphasizes practical applications significantly by training the students in food auditing, food analysis and product development. The course also exposes students to entrepreneurship, consumer psychology, branding and marketing strategies, as a means to promote self-employment and to widen the scope of work. Over the past several years, our students have found successful positions in various sectors such as Food Industries, Food Testing Laboratories, Food Consultancies and Academia. Furthermore, a substantial number of students opt to pursue higher education at national and international universities.

Sign of Head of the Institute:

Sign of Dean:

Name of the Head of the Institute:

Dr. Anuradha J. Bakshi
I/C Principal

Name of the Dean

Name of the Department

Foods, Nutrition and Dietetics

Name of the Faculty