Estd. 1962
"A++" Accredited by NAAC(2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA
www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४,महाराष्ट्र
दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९३/९४

SU/BOS/Science/499 **Date: 10/07/2023**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of **M.Sc. Part-I (Sem. I & II) as per NEP-2020** degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-I (Sem. I & II) as per NEP-2020 degree programme under the Faculty of Science and Technology.

M.Sc.-Part I (Sem. I & II) as per NEP-2020			
1.	Microbiology (HM)	10.	Data Science
2.	Pharmaceutical Microbiology (HM)	11.	Computer Science
3.	General Microbiology	12.	Information Technology (Entire)
4.	Electronics	13.	Food Science & Technology
5.	Embedded Technology	14	Food Science & Nutrition
6.	Geology	15.	Biochemistry
7.	Sugar Technology (Entire)	16.	Biotechnology
8.	Alcohol Technology (Entire)	17.	Medical Information Management
9.	Agro Chemical & Pest Management (AGPM)	18.	Environmental Science
		19.	Physics

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962

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Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

Master of Science (Food Science and Technology)

under
Faculty of Science and Technology

(To Be Implemented From Academic Year 2023-24)

INDEX

1. Preamble

The M.Sc. in Food Science and Technology program is designed to provide students with a comprehensive understanding of the science behind food production, processing, marketing and safety. Through a blend of theoretical coursework and hands-on laboratory experiences, students will explore the intricacies of food chemistry, microbiology, quality control, and nutrition. The program aims to equip students with the knowledge and skills required to address contemporary challenges in the food industry, including sustainability, food safety regulations, and innovative food product development. By fostering critical thinking and research capabilities, this M.Sc. program prepares students for diverse career opportunities in food science & technology, quality control and assurance, research, and development. The course intend to develop competent food scientist and technologist through proactive teaching and learning process, research, entrepreneurship and extension activities leading towards sustainable growth of the society.

2. Duration

The program duration is 2 Years i.e. M.Sc. Part I (Level 6) and M. Sc. Part II (Level 6.5)
Students can exit after completion of M. Sc. Part I (Level 6.0) with - Post Graduate Diploma in Food Science and Technology
Students can exit after completion of M.Sc. Part II (Level 6.5) with - Post Graduate in Food Science and Technology

3. Eligibility for Admission

A. Candidate possessing B.Sc. Degree in any subject from Shivaji University or any other Statutory University with minimum 55% marks.

OR

ii. Candidate possessing Bachelor degree (B. Sc. /B. Tech. / B. E) in Food Science and Technology/Food Science/Food Technology/Food Science and Quality Control/Food Technology and Management/Food Processing / Food Engineering/ Food Process Engineering/ Food Processing and Preservation/Food Processing and Packaging/Agriculture/Horticulture /Home Science.

OR

iii. Candidate passing 12 th Science and possessing B. Voc. Degree in Food Science and Technology/Food Science/ Food Technology/ Food Processing/ Food Processing and Management/ Food Processing and Technology/ Food Processing and Post Harvest Technology/ Food Processing and Preservation/ Food Processing and Packaging with minimum 55% marks from Shivaji University or any other Statutory University.

B. All the candidates eligible as mentioned with above eligibility criteria have to pass entrance examination conducted by the Department of Food Science and Technology, Shivaji University, Kolhapur.

C. For the admission under Industry Sponsored category, the selection of candidates will be on the basis of merit in entrance examination. Candidates will be required to submit a letter from the sponsoring company / industry. The industry sponsored candidates have to fulfil the above eligibility criteria **A** and **B**.

4. Medium of Instruction

English shall be the medium of instruction and examination.

5. Programme Structure

Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
M.Sc. (Food Science and Technology) Part – I (Level-6.0)

SEMESTER – I (Duration – Six Month)											
	Course Code	TITLE OF THE PAPER	TEACHING SCHEME			EXAMINATION SCHEME					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
Major Mandatory	MMT-101	Food Chemistry	4	4	4	80	32	3	20	8	1
	MMT-102	Food Microbiology	4	4	4	80	32	3	20	8	1
	MMT-103	Advance Instrumentation in Food Analysis	2	2	2	40	16	2	10	4	0.5
	MMPR-104	Laboratory Course I	4	8	4	100	40	---	---	---	---
Major Elective	MET-105	Principles of Food Processing & Preservation OR Biochemistry and Nutrition	4	4	4	80	32	3	20	8	1
RM	RM-106	Research Methodology	4	8	4	80	32	3	20	8	1
TOTAL					22						

SEMESTER – II (Duration – Six Month)											
SR. NO.	Course Code	TITLE OF THE PAPER	TEACHING SCHEME			EXAMINATION SCHEME					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
Major Mandatory	MMT-201	Food Engineering	4	4	4	80	32	3	20	8	1
	MMT-202	Food Packaging	4	4	4	80	32	3	20	8	1
	MMT-203	Entrepreneurship Development in Food Processing	2	2	2	40	16	2	10	4	0.5
	MMPR-204	Laboratory Course II	4	8	4	100	40	---	---	---	---
Major Elective	MET-205	Food Quality and Safety Management OR Food Additives, Contaminants and Toxicology	4	4	4	80	32	3	20	8	1
OJT	OJT-206	On Job Training/Internship	---	---	4	100	40	---	---	---	---
TOTAL					22						
TOTAL (Sem I + Sem II)					**44**						
Lec. : Lecture, Pract.: Practical, Max.: Maximum, Min.: Minimum											

<table>
<tr><td>• MMT – Major Mandatory Theory
• MMPR – Major Mandatory Practical
• MET – Major Elective Theory
• MEPR – Major Elective Practical
• RM - Research Methodology
• OJT/FP- On Job Training/ Field Project</td><td>• Total Marks for M.Sc.-I : 1100
• Total Credits for M.Sc.-I (Semester I & II) : 44
• Separate passing is mandatory for University and Internal Examinations</td></tr>
<tr><td colspan="2">*Evaluation scheme for OJT/FP shall be decided by concerned BOS</td></tr>
<tr><td colspan="2">• Requirement for Entry at Level 6.0:
Students with Bachelor Degree of 3 Years or 6 Semester program duration.</td></tr>
<tr><td colspan="2">• Requirement for Exit after Level 6.0:
Students can exit after completion of Level 6.0 with Post Graduate Diploma in Food Science and Technology</td></tr>
<tr><td colspan="2">• Requirement for Entry at Level 6.5:
Students with Bachelor Degree (Honours/Research) of 4 Years or 8 Semester program duration.</td></tr>
</table>

Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
M.Sc. (Food Science and Technology) Part – II (Level-6.5)

		SEMESTER – III (Duration – Six Month)									
SR. NO.	Course Code	TITLE OF THE PAPER	TEACHING SCHEME			EXAMINATION SCHEME					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
Major Mandatory	MMT-301	Cereal and Legume Technology	4	4	4	80	32	3	20	8	1
	MMT-302	Fruit and Vegetable Technology	4	4	4	80	32	3	20	8	1
	MMT-303	New Food Product Development	2	2	2	40	16	2	10	4	0.5
	MMPR-304	Laboratory Course III	4	8	4	100	40	---	---	---	---
Major Elective	MET-305	Technology of Oilseeds and Fats OR Post-harvest Technology of Plantation Crops	4	4	4	80	32	3	20	8	1
RP	RP-306	Research Project - Phase I	4	8	4	100	40	---	---	---	---
TOTAL					22						

		SEMESTER – IV (Duration – Six Month)									
SR. NO.	Course Code	TITLE OF THE PAPER	TEACHING SCHEME			EXAMINATION SCHEME					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
Major Mandatory	MMT-401	Technology of Milk and Milk Products	4	4	4	80	32	3	20	8	1
	MMT-402	Technology of Meat, Fish and Poultry Products	4	4	4	80	32	3	20	8	1
	MMPR-403	Laboratory Course IV	4	8	4	100	40	---	---	---	---
Major Elective	MET-404	Fermentation Technology OR Food Biotechnology	4	4	4	80	32	3	20	8	1
RP	RP-405	Research Project - Phase II	6	12	6	100	40	---	50	20	---
TOTAL					22						
TOTAL (Sem III + Sem IV)					**44**						
TOTAL (Part I + Part II)					**88**						

Lec. : Lecture, Pract.: Practical, Max.: Maximum, Min.: Minimum

• MMT – Major Mandatory Theory • MMPR – Major Mandatory Practical • MET – Major Elective Theory • MEPR – Major Elective Practical • RP- Research Project	• Total Marks for M.Sc.-II : **1100** • Total Credits for M.Sc.-II (Semester III & IV) : 44 • ***Separate passing is mandatory for University and Internal Examinations***
# Evaluation scheme for Research Project shall be decided by concerned BOS	
## Evaluation scheme for Research Project shall be decided by concerned BOS	
• **Requirement for Exit after Level 6.5:** **Students can exit after completion of Level 6.5 with Post Graduate in Food Science and Technology**	

6. Programme Outcomes (POs)

- Student will have an ability to apply knowledge of Food Science, Food Processing, Food Engineering and Technology
- Student will have an ability to analysis the problems in food science, food processing and food technology, and will be competent to control them during foods manufacturing and storage
- Student will have an ability to identify problems and design to resolve the problems in the actual situations during food processing, food quality controlling, food packaging and storage
- Student will have an ability to express practical proficiency in the field of food analysis, food processing and food preservation
- Student will have advanced knowledge of food microbiology, food science, food engineering, food quality and food processing technology
- Student will have an ability of designing and development of food products as per the need of society keeping the value of food safety and health benefits
- Student will have an ability to understand the impact of the professional scientific and technical solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- Student will have an ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- Student will have an ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- Student will have an ability to communicate effectively for self development
- Student will have knowledge of industrial economics and management of food industries
- Student will have an ability to recognize the need, and have preparations and ability to engage in independent and life-long learning in the broadest context of technological change

7. Course Codes

The course code for M.Sc. Food Science and Technology course is as follows:

M. Sc. Semester - I		
Sr. No.	**Major Mandatory**	**Course Code**
1	MMT-101 Food Chemistry (4 credit)	**MSU0325MML917G1**
2	MMT-102 Food Microbiology (4 credit)	**MSU0325MML917G2**
3	MMT-103 Advance Instrumentation in Food Analysis (2 credit)	**MSU0325MML917G3**
4	MMPR-104 Laboratory Course I (4 credit)	**MSU0325MMP917G**
5	RM-106 Research Methodology (4 credit)	**MSU0325RML917G**
	Major Elective	
6	MET-105 Principles of Food Processing & Preservation (4 credit)	**MSU0325MEL917G1**
	MET-105 Biochemistry and Nutrition (4 credit)	**MSU0325MEL917G2**
M. Sc. Semester - II		
	Major Mandatory	
1	MMT-201 Food Engineering (4 credit)	**MSU0325MML917H1**
2	MMT-202 Food Packaging (4 credit)	**MSU0325MML917H2**
3	MMT-203 Entrepreneurship Development in Food Processing (2 credit)	**MSU0325MML917H3**
4	MMPR-204 Laboratory Course II (4 credit)	**MSU0325MMP917H**
5	OJT-206 On Job Training/Internship (4 credit)	**MSU0325OJP917H**
	Major Elective	
6	MET-205 Food Quality and Safety Management (4 credit)	**MSU0325MEL917H1**
	MET-205 Food Additives, Contaminants and Toxicology (4 credit)	**MSU0325MEL917H2**
M. Sc. Semester - III		
	Major Mandatory	
1	MMT-301 Cereal and Legume Technology (4 credit)	**MSU0325MML917I1**
2	MMT-302 Fruit and Vegetable Technology (4 credit)	**MSU0325MML917I2**
3	MMT-303 New Food Product Development (2 credit)	**MSU0325MML917I3**
4	MMPR-304 Laboratory Course III (4 credit)	**MSU0325MMP917I**
5	RP-306 Research Project - Phase I (4 credit)	**MSU0325RPP917I**
	Major Elective	
6	MET-305 Technology of Oilseeds and Fats (4 credit)	**MSU0325MEL917I1**
	MET-305 Post-harvest Technology of Plantation Crop (4 credit)	**MSU0325MEL917I2**
M. Sc. Semester - IV		
	Major Mandatory	
1	MMT-401 Technology of Milk and Milk Products (4 credit)	**MSU0325MML917J1**
2	MMT-402 Technology of Meat, Fish and Poultry Products (4 credit)	**MSU0325MML917J2**
3	MMPR-403 Laboratory Course IV (4 credit)	**MSU0325MMP917J**
4	RP-405 Research Project - Phase II (6 credit)	**MSU0325RPP917J**
	Major Elective	
5	MET-404 Fermentation Technology (4 credit)	**MSU0325MEL917J1**
	MET-404 Food Biotechnology (4 credit)	**MSU0325MEL917J2**

8. Syllabus

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Chemistry
Course Code: MSU0325MML917G1
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-understand chemistry of food to control a chemical and biochemical reaction that influence food quality
-learn the principles behind analytical techniques associated with food components and related problems
-study role of food nutrients and its use for preservation of food
-study the basic nutrients and their requirements for human nutrition Evaluate new product development.
-demonstrate practical proficiency in a food analysis laboratory

Unit-1 (15 lectures)
Food chemistry-definition and importance.
Water in food. Structure of water and ice. Phase diagram of water.
Sorption isotherm. Water activity and shelf life of food.
Chemistry and classification of Lipids. Nomenclature of fatty acids.
Physical and chemical properties of lipids.
Use of lipids in foods and effects of processing on functional properties.
Unit-2 (15 lectures)
Chemistry and classification of Carbohydrates.
Structure and nomenclature of carbohydrates.
Chemical reactions of carbohydrates.
Functional properties and preparation of sugars, polysaccharides and their modifications
Chemistry and classification of Protein and amino acids.
Structure of protein. Denaturation and functional properties of proteins.
Maillard browning. Protein concentrates, isolates and hydrolyzates.
Unit-3 (15 lectures)
Structure and solubility of Vitamins and Minerals. Acid/Base chemistry for minerals.
Chemical and functional stability of vitamins and minerals.
Effect of processing on vitamins and minerals.
Antinutritional factors in food and methods of inactivation.
Unit-4 (15 lectures)
Food flavour and colours. Natural food flavours and taste compounds.
Pigments in animal and plant tissue. Changes in food flavours and colours due to processing.

Suggested Readings
Srinivasan Damodaran and Kirk L. Parkin. 2017. Fennema's Food Chemistry.
CRC Press. Taylor & Francis Group. Finland.
Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
John M. deMan. 2013. Principles of Food Chemistry. Springer. New York.
Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science. Pergamon Press, New York.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Microbiology
Course Code: MSU0325MML917G2
Total Credits: 04
Course Outcomes:

Upon successful completion of this course, the student will be able to:
-understand and identify the various microbes associated with foods and food groups
-understand and use various microbiological techniques for the study of foods
-understand and identify the role of this microbe in food spoilage, food preservation
-acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems and the methods used to detect pathogens in foods
-understand the methods of isolating and characterizing various microbes associated with foods and food groups

Unit-1 (15 lectures)
History and scope of food microbiology.
Types of micro-organism normally associated with foodbacteria, yeast and mold.
Diversity of Habitat. Microbial growth pattern.
Intrinsic and extrinsic factors affecting growth of micro-organisms.

Unit-2 (15 lectures)
Micro-organisms in natural food products and their control.
Biochemical changes caused by microorganisms,
deterioration and spoilage of various types of food products, microbial food fermentation.
Contaminants of foods-stuffs, vegetables, cereals, pulses, oilseeds,
milk and meat during handling and processing.

Unit-3 (15 lectures)
Microbial quality control and microbial standards for foods.
Food microbiology and public health.
Food born diseases and food born illness.
Food poisoning and microbial toxins.
Food borne intoxicants and mycotoxins.

Unit-4 (15 lectures)
Microbiological examination of food. Direct examination, Culture Techniques
Enumeration methods – Plate count and Most probable number count.
Rapid detection techniques for spoilage micro-organisms and toxins.

Suggested Readings

M. R. Adams and M. O. Moss 2008. Food Microbiology. Royal Society of Chemistry, UK
William C. Frazier, Dennis C. Westhoff. 2013. Food Microbiology. Mc Graw Hill India.
Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.
Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Advance Instrumentation in Food Analysis
Course Code: MSU0325MML917G3
Total Credits: 02
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-explain theoretical principles of instrumental analysis of food
-learn different methods of identification of organic compounds.
-describe general principles and procedures involved in techniques of food analysis
-learn basic knowledge about the calibration of analytical instruments.

Unit-1 (15 Lectures)
Overview of Food Analysis. Importance of advanced instrumentation in food analysis.
Introduction to Advanced Instrumentation in Food Analysis
Current trends and challenges in food analysis
Sampling techniques and preparation of Sample.
Chromatographic Techniques : Principles and Application in Food Analysis
Gas chromatography, High-performance liquid chromatography, Thin-layer chromatography
Unit-2 (15 Lectures)
Spectroscopic Techniques : Principles and Application in Food Analysis
UV-visible spectroscopy, FTIR spectroscopy, NMR spectroscopy,
Atomic Absorption Spectroscopy
Mass Spectroscopy and ICP- OES/MS
Differential Thermal Analysis and Differential Scanning Calorimetry
Scanning Electron Microscopy

Suggested Readings

Semih Ötles (2009). Handbook of Food Analysis Instruments. CRC Press Taylor & Francis Group, Boca Raton, FL
Yeshajahu Pomeranz and Clifton E. Meloan (1994). Food Analysis Theory And Practice. 3rd Edition. Chapman & Hall One Penn Plaza New York, NY.
J.R.J. Paré and J.M.R. Bélanger (1997). Instrumental Methods in Food Analysis. Elsevier Science

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Principles of Food Processing & Preservation
Course Code: MSU0325MEL917G1
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-understand the need for food preservation and processing
-understanding the different preservation technique
-gain knowledge of the principles of food spoilage and the ways to prevent
-identify & select appropriate processing equipments and preservation methods

Unit-1 (15 lectures)
Scope and importance of food processing: national and international perspectives.
Food processing techniques and types of processed products
(Minimally Processed, Intermediate Processed and Highly Processed Food Products)
Principles of preservation methods. Chemical preservations of foods.
Unit-2 (15 lectures)
Food preservation by low-temp: Cold Storage, Chilling and super chilling, Refrigeration, Freezing and Freeze-drying. Cryogenic preservation.
Advantages and disadvantages of low temperature preservation techniques.
Unit-3 (15 lectures)
Food preservation by heating: Drying, Dehydration, Osmotic Dehydration, Blanching, Cooking, Canning, Pasteurization, Sterilization, Baking and Extrusion cooking.
Unit-4 (15lectures)
Non-thermal preservation: Hydrostatic pressure, Dielectric heating, Ohmic Heating, Radiofrequency heating, Microwave processing, Irradiation, Membrane technology and Hurdle technology.

Suggested Readings

Hosahalli S. Ramaswamy, Michele Marcotte. 2005. Food Processing: Principles and Applications. CRC Press. Taylor & Francis Group. Boca Raton, Finland.
Fellows, P. and Ellis H. 1990. Food Processing Technology: Principles and Practice, New York.
Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA. Norman N. Potter and Joseph H. Hotchkiss. 1998. Aspen Publishers Inc., Maryland.
Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration. AVI, Westport.
Bender, A.E. 1978. Food Processing and Nutrition. Academic Press, London.
Lewis, M.J. 1990. Physical Properties of Food and Food Processing Systems. Woodhead, UK.
Wildey, R.C.1994. Minimally Processed Refri. Fruits and Vegetables. Chapman and Hall, London.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Biochemistry and Nutrition
Course Code: MSU0325MEL917G2
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-understand physiological and metabolic functions of nutrients
-familiarize nutritional assessment, RDA and Dietary Recommendations & guidelines
-understand and determine BMR and, food composition and energy balance in dietary planning
-understand diet plan formulation for health and for nutrition-related disorders.
-identify appropriate techniques for Biochemical analysis of blood, urine

Unit-1 (15 lectures)
Concept and scope of Nutrition and Health.
Metabolic Rate, Nutritional Requirement and RDA.
Human Physiology: Respiratory System, Gastrointentestinal System and Excretory System.
Blood and blood composition.
Nutritional assessment of human: nutritional anthropometry and biochemical tests
Unit-2 (15 lectures)
Nutritional Biochemistry. Carbohydrate Metabolism: Digestion and absorption of carbohydrates.
Glycolysis, TCA cycle & energy generation, gluconeogenesis,glycogenesis, glycogenolysis.
Blood sugar regulation. Disorders of carbohydrate metabolism.
Lipid Metabolism: triacylglycerol, adipose tissue, ketone bodies, cholesterol
Oxidation and biosynthesis of fatty acids.
Lipid storage disorders and metabolic syndromes.
Unit-3 (15 lectures)
Protein Metabolism: Digestion and absorption of Protein. Urea cycle.
Biosynthesis of nonessential amino acids. Biochemical role of Vitamins and Minerals.
Deficiency disorders.
Unit-4 (15 lectures)
Nutrition of dietary fibres. Energy value of foods. Protein quality: PER, NPU and BV.
Formulation of diets and food products for specific needs.
Nutraceuticals and functional foods.

Suggested Readings

Shubangini A Joshi.1998. Nutrition and Dietetics.Tata McGraw Hill Pub. Co. Ltd., New Delhi
Srilakshmi. B. 2005. Dietetics. 5th Edition.New Age International (P) Ltd, Publishers,Chennai.
National Institute of Nutrition. 2005. Dietary Guidelines for Indians – A Manual, Hyderabad.
Altschul, A.M. and Wilcke, H.L. Ed. 1978. New Protein Foods. Vol. III. Academic Press, New York.
Bodwell, C.E. Ed. 1977. Evaluation of Proteins for Humans. AVI, Westport.
Milner, M., Scrimshaw, N.S. and Wang, D.I.C. Ed. 1978. Protein Resources and Tech. AVI, Westport.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Laboratory Course I
Course Code: MSU0325MMP917G
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-acquire practical skills required in analysis of food
-learn practically about the principles and methods of food analysis
-explain and describe about chemical and microbial quality of food

Group - A
Study of laboratory instruments
Determination of moisture content of given food sample
Determination of fat content by soxhlet method
Determination of protein by kjeldahl`s method
Determination of ash content from given food sample
Determination of crude fibre by weende's method
Determination of Iron and Determination of Calcium
Estimation of starch by using anthrones method
Estimation of reducing sugar / non-reducing sugar by fehling's method
Estimation of fructose by using resorcinol method
Estimation of Ascorbic Acid by using 2, 6 dichlorophenol indophenols
Group - B
Preparation and sterilization of nutrient media and utensils
Determination of Total Plate Count
Determination of Yeast and Mold Count
Determination of Most Probable Number
Detection and Confirmation of Salmonella / Listeria monocytogene in Food Products
Detection of Coliforms and E. coli in Food Products
Isolation of pure culture by Streak plate technique
Isolation of pure culture by Spread plate technique
Isolation of pure culture by Pour plate technique
Study of Gram staining techniques, Monochrome staining techniques, Negative staining techniques
Study of IMViC test
Group - C1
Study of Processing Equipments
Study Freezing of Food
Blanching of Fruits and Vegetables
Dehydration of Fruits and Vegetables
Study of Salting of Food
Study of Osmosis Process
Isolation and characterization of starch
Isolation and characterization of casein
Group - C2
Anthropometric Assessment of Body
Determination of energy value of food
Determination of BMR
Determination of Haemoglobin
Determination of Daily energy requirement of body
Study of Hematology Analyzer
Study of Blood Biochemistry Analyzer
Study of Balanced Diet Plan

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester I)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Research Methodology
Course Code: MSU0325RML917G
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-design a research problem by applying appropriate experimental design
-statistically analyze the collected data
-explain the ethics in research and plagiarism
-write research papers, reports and research proposals

Unit-1 (15 Lectures)
Introduction and Overview of Research: Definition, Philosophy and Objective of research.
Basic Concepts in Research: Literature Review, Research process, Research problem, Research problem identification, Research designs, Research Plan etc. Types of research and research design. Safety issues in food research laboratory. Ethics in research: Responsible conduct. The regulations and ethics for use of animal and human subject
Unit-2 (15 Lectures)
Data Collection and Processing: Methods of data collection. Primary data and Secondary data.
Classification and compilation of data. Processing of data collected.
Presentation of data – Diagrams/Graphs/Tables/Charts etc.
Concepts in statistical quality control: mean, mode, median, variance and standard deviation
Statistical tools for data analysis: MS Excel, Matlab, Minitab.
Statistical approach for new product development: Response Surface Methodology.
Unit-3 (15 Lectures)
Testing of hypothesis: Overview and Concept of probability, probability distribution.
Testing the level of significance, two tailed and one tailed tests, Z-test, t-test, x2-test, F-test
Testing of correlation coefficients, ANOVA – one way ANOVA, two way ANOVA Tukey's HSD
Multivariate analysis: Multiple regression, multiple discriminant analysis, multiple analysis of variance
Unit-4 (15 Lectures)
Writing a Scientific/Technical Report/Research Paper: Structure and components of Scientific Reports. Technical Reports and Thesis. Steps in the preparation of reports and thesis layout.
Citation and Referencing the literature. Components of Research Presentation: Poster and Oral Presentation. Preparation of Poster/Slides. Publication of Research Work: Selection of Journal, Indexing and Citation Score, Impact Factor. Plagiarism and Intellectual Property Rights

Suggested Readings

Merton R. Hubbard (2013). Statistical Quality Control for the Food Industry. Springer New York, NY
Montgomery, D. C., (2001). Design and Analysis of experiments, 5th Edition, John Wiley & Sons.
Kothari, C.R. (2008). Research Methodology: Methods and Techniques. Second Edition. New Age International Publishers, New Delhi
Vining, G. G. and Kowalski, S. (2010). Statistical Methods For Engineers.2nd Edn. Cengage Learning (RS), Boston, USA.
Arya, P.P. and Pal , Y. (2001).Research Methodology in Management: Theory and Case Studies, Deep and Deep Publishers Pvt. Ltd., New Delhi.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Engineering
Course Code: MSU0325MML917H1
Total Credits: 04
Course Outcomes:

Upon successful completion of this course, the student will be able to:
-understand the basic principles of various food unit operations and its applications
-acquire knowledge of the food processing equipments used for the different unit operations
-learn the calculations of mass balance and energy balance of food processes
-know the importance of Food Process Engineering as one of the major pillars of the discipline
-obtain knowledge in application of scientific principles in the processing technologies
-develop an ability to identify, formulate, and solve engineering problems

Unit-1 (15 lectures)

Definitions of Velocity and Speed, Acceleration, Force and Momentum,
Weight, Pressure, Work and Energy, Power. Unit operation in food engineering.
Heat transfer-modes of heat transfer, conduction, convection and radiation. Heat exchangers and their designs.
Heat processing of foods: Evaporation and Concentration, Dehydration and Drying, Boiling and Condensation, Blanching, Pasteurization, Sterilization and crystallization.

Unit-2 (15 lectures)

Mass and energy balance. Fick's law of diffusion. Theories and unit operations of mass transfer.
Fluid flow, fluid statics, fluid dynamics, fluid flow applications. Newton's Law of Rheology.
Freezing operations and Planck's Equation. Freezing curve.

Unit-3 (15 lectures)

Mechanical separation-filtration, membrane concentration, sieving, centrifugation, sedimentation,
Mechanical handling-conveying and elevation.
Size reduction and classification-mixing, kneading, blending.

Unit-4 (15 lectures)

Food Plant Layout. Engineering aspects in designing the new equipment
Installation and Housing of Equipments. Maintenance of Equipments. Engineered Food

Suggested Readings

Romeo T. Toledo. 1999. Fundamentals of Food Process Engineering. Third Edition. Aspen publisher.
S. S. H. Rizvi and Gauri S. Mittal. 1992. Experimental methods in food engineering.
Kluwer Academic Publishers Group.
Heldman, D.R. and Lund, D.B. Ed. 1992. Handbood of Food Engineering marcel Dekker, New York.
Batty, J.C. and Folkman, S.L. 1983. Food Engineering Fundamentals. John wiley and Sons, N.York.
Harper, J.C. 1975. Elements of Food Engineering. AVI, Westport.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Packaging
Course Code: MSU0325MML917H2
Total Credits: 04
Course Outcomes:

Upon successful completion of this course, the student will be able to:
-understand the various properties of food packaging materials
-gain an ability to select suitable packaging material for different food substances
-describe the role and function of packaging materials used for a range of consumer food
-relate the properties of food packages to conversion technologies, processing and packaging technologies and user requirements including safety, convenience and environmental issues
-describe the technology involved in the production, shaping and printing of various packaging materials and package

Unit-1 (15 lectures)

Introduction to packaging technology. Package Evaluation
Functions of packaging. Properties of packaging material.
Types of packaging- Primary/Secondary/Tertiary
Labelling guidelines for packaged foods. Label printing and bar-coding.

Unit-2 (15 lectures)

Paper and Paper Board: Manufacturing method and Types.
Glass Containers: Composition and Manufacturing Method.
Plastics and Polymers: Composition and Types. Non-migratory bioactive polymers.

Unit-3 (15 lectures)

Rigid Packaging Material (Non Plastic) - CFB, Composites, Metal, Wood etc.
Fibre board Containers, Drums, Tin, Aluminium Cans / Containers, Aluminium Foils, Steel Drums, Wooden Containers / Crates.
Laminates, Multilayer packaging, Flexible packaging.

Unit-4 (15 lectures)

Packaging Techniques- Vacuum Packaging, Shrink packaging, Aseptic Packaging
Modified Atmosphere Packaging and Controlled Atmosphere Packaging.
Active and Intelligent Packaging, Antimicrobial packaging, Edible packaging.
Shelf Life Testing of Food Products. Direct Testin and Accelerated Shelf Life Testing.

Suggested Readings

G. L. Robertson. 2006. Food Packaging: Principles And Practice. CRC Press, T&F Group, Boca Raton, FL
R. Ahvenainen. 2003. Novel food packaging techniques. Woodhead Publishing Limited, England
Jung Han. 2005. Innovations in Food Packaging. Elsevier Science & Technology Books
M.L. Rooney. 1995. Active Food Packaging. Blackie Acad. & Profl. Chapman & Hall, Glasgow

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Entrepreneurship Development in Food Processing
Course Code: MSU0325MML917H3
Total Credits: 02
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-explain the meaning of entrepreneurship and identify the role of entrepreneurs
-identify different types of entrepreneurship opportunities
-understand the components of entrepreneurship in food and allied business sector
-establish a small scale enterprise in food sector

Unit-1 (15 Lectures)
Introduction to Entrepreneurship in Food Processing.
Overview of food processing sectors and opportunities.
Traits and characteristics of successful food entrepreneurs.
Entrepreneurial development – objectives and skills required for entrepreneurship.
Factors influencing entrepreneurship.
Functions and classification of Entrepreneur.
Organizational Assistance to an entrepreneur.
Government schemes and incentives for promotion of entrepreneurship.
Unit-2 (15 Lectures)
Elements of a business plan for food processing startups.
Market positioning and competitive analysis.
Financial Management of Business.
Costing & Pricing. Inventory Management and Working Capital Management
Book Keeping and accountancy.
Enterprise growth, expansion & diversification.
Detailed Project Report (DPR) : Concept, Elements and Preparation

Suggested Readings

K P Sudheer and V. Indira (2021). Introduction to Entrepreneurship Development in Food Processing. CRC Press, London
Abha Mathur (2021). Entrepreneurship Development. TAXMANN's Publication.
P. Saravanavel & P. Sumathi (2020). Entrepreneurial Development. Margham Publications
Dr. A. K. Shukla (2022). Industrial Management And Entrepreneurship Development. Jai Prakash Nath Publication Meeruth.
Dr. S. Senthil (2018). Entrepreneurship Development. Suchitra Publication.

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Quality and Safety Management
Course Code: MSU0325MEL917H1
Total Credits: 04
Course Outcomes:

Upon successful completion of this course, the student will be able to:
-develop a HACCP plans for different food industries
-understand knowledge of HACCP certification
-understand laws and regulations governing food safety principles (FSMS and HACCP)
-understand industry food safety requirements and certifications
-understand auditing and different auditing schemes, and be able to complete internal audits

Unit-1 (15 lectures)
Definition of Food Quality. External and internal quality factors. Assessment of food quality.
Sample and Sampling methods. Food testing laboratory and food analyst. NABL accreditation.
Methods of food quality evaluation - Physical, Chemical, Microbiological, Sensorial.
Instrumental analysis of food – Texture, Viscosity, Consistency, Colour, Flavour
Unit-2 (15 lectures)
Food safety and security. Food laws and standards – National and International.
Indian food laws and regulations – Prevention of Food Adulteration Act, Essential Commodity Act, Food Safety and Standard Act, Food Safety and Standards Regulations.
Voluntary Standards: BIS and AGMARK. Structure and salient features of FSSA, 2006.
Food Licensing and Registration.
Unit-3 (15 lectures)
Food Quality Management System – International Organization for Standardization (ISO)
Food Safety Management System – HACCP, ISO 22000, FSSC, BRC, PRPs (GAP,GMP,GHPetc.)
Codex Alimentarius Commission, WHO, FAO, WTO, USFDA
Export (Quality Control and Inspection) Act, Custom Act, Import Control regulation
Unit-4 (15 lectures)
Introduction to auditing. Definition and Types of audits.
Auditing principles, Auditor attributes, Roles and responsibility of auditors.
Internal audit planning and preparation.
Conducting an audit, Reporting audit results, Corrective action and audit follow-up activities.
Waste disposal methods. Environmental Protection Act and ISO 14000.

Suggested Readings

The Food Safety and Standards Act, 2006. Professional Book Publishers, Delhi.
The Prevention of Food Adulteration Act, 1954 & The Food Safety and Standard Act, 2006. Professional Book Publishers, Delhi.
Ranganna S. 2012. Handbook of analysis and quality control for fruits and vegetable products. Tata McGraw Hill Education Pvt. Ltd., New Delhi
Pomeranz Y and Meloan C. 2000. Food Analysis: Theory and Practice. Aspen Publication, Maryland
H. R. Moskowitz, J. H. Beckley and A. V. A. Resurreccion. 2006. Sensory and consumer research in food product design and development. IFT Press, Blackwell publishing. Iowa, USA.
R. Lawley, L. Curtis and J. Davis. 2008. The Food Safety Hazard Guidebook. Royal Society of Chemistry Publication, UK
R. H. Schmidt and G. E. Rodrick. 2003. Food Safety Handbook. Wiley-Interscience. John Wiley & Sons Publication, New Jersey

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Food Additives, Contaminants and Toxicology
Course Code: MSU0325MEL917H2
Total Credits: 04
Course Outcomes:

Upon successful completion of this course, the student will be able to:
-understand the functions of different food additives in improving quality characteristics of foods
-explore the types and properties of additives, pigments, flavouring compounds and their processing effect
-acquire basic understanding of the principles of food toxicology
-identify appropriate techniques for analysis of additives
-recognize the common analytical techniques for detection of food adulterant

Unit-1 (15 lectures)
Introduction to food additives. Types of additives.
Functions of food additives.
Food additives intake assessment.
Food Preservatives – Classification (Class I, Class II and Grass)

Unit-2 (15 lectures)
Natural food additive (Vitamins, Minerals, Pigments, Amino Acids, Essential Fatty Acids).
Food fortification and supplementation.
Fat substitute and replacers.
Sweeteners.

Unit-3 (15 lectures)
Sequestering and chelating agents.
Emulsifying, Stabilizing and Thickening agents.
Antioxidants. Antifoaming and Anticaking agents.
Desiccants and Humectants.

Unit-4 (15 lectures)
Contamination of food. Types of food contaminants and sources. Food Allergens.
Food Toxicology. Toxicity – Acute, Subacute, Subchronic, Chronic.
Toxicology study – In-vitro and In-vivo.
Dose and Responses -NOEL, LD50

Suggested Readings

S. N. Mahindru. 2012. Food Additives. APH Publishing Corporation, New Delhi.
T. Pussa. 2008. Principles of food toxicology. CRC press. Taylor & Francis Group. New York.
A. L. Branen, P. M. Davidson, S. Salminen and J. H. Thorngate. 2001. Food Additives. Marcel Dekker, Inc. NY
T. Shibamoto and L. F. Bjeldanes. 1993. Introduction to Food Toxicology. Academic Press, Inc. California

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: Laboratory Course II
Course Code: MSU0325MMP917H
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-learn practically about the principles involved in different machinery
-acquire practical skills required in analysis of food packaging material
-explain about methods of analyzing food and additives

Group - A
Study of Heat Exchangers
Study of Laboratory Mill
Study of Dryers
Study of Separation Equipments
Study of Crystallizer
Determination of Physical Properties of Food
Determination of Browning intensity
Determination of Drying Rate Curve

Group - B
Preparation of Packaging material album
Determination of GSM of packaging material
Determination of WVTR
Cut out examination of canned food products
Study of filling and sealing methods
Study of Tearing Strength Tester
Study of Bursting Strength Tester
Study of Breaking Strength Tester

Group - C1
Sensory evaluation methods
Colour analysis by using Lovibond Tintometer
Colour analysis by using Hunter Colour Lab
Determination of Viscosity by Brookfield Viscometer
Determination of Food Texture by Texture Analyzer
Detection of Adulteration in Common Food Products
Study of HPLC/GCMS/AAS

Group - C2
Estimation of Chlorophyll content
Estimation of Carotenoid Content
Determination of Sodium Benzoate Content
Determination of Salt Content
Study of relative sweetness of sweeteners
Estimation of tyrosine value and Thiobarbituric acid value

M. Sc. Food Science and Technology (Part I) (Level-6.0) (Semester II)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Title of Course: On Job Training/Internship
Course Code: MSU0325OJP917H
Total Credits: 04
Course Outcomes:
Upon successful completion of this course, the student will be able to:
-explore career alternatives prior to graduation
-describe the components of food industry and allied sectors
-develop work habits and attitudes necessary for job success
-acquire employment contacts leading directly to a full-time job

The student will undergo On Job Training/Internship at Food Processing Industry/Analytical Laboratories/Research Institutes/Any other organization of students carrier interest.

9. Scheme of Teaching

Theory:
Lecture and seminar method will be used for all the Mandatory and Elective theory courses
Each Lecture will be of 1 Hour
In a week 4 lectures will be there for a course with 4 credits
In a week 2 lectures will be there for a course with 2 credits

Practical:
Practical and demonstration method will be used for all the Mandatory practical courses
Each Practical will be of 2 Hour
In a week 4 practicals will be there for a laboratory course with 4 credits

On Job Training:
The student will undergo On Job Training/Internship for minimum 15 Days at either of the following

- Food Processing Industry
- Analytical Laboratories
- Research Institutes
- Any other organization of students carrier interest

Research Project:
Students will be guided for the research project in the filed of food science and technology.
In a week student has to work for 8 Hours for a course with 4 credits
In a week student has to work for 12 Hours for a course with 6 credits

10. Examination Pattern

Theory:
There will be a 100 Marks examination for a course with 4 credits
The assessment of course with 4 credits will be as follow
-University Assessment of 3 Hours Examination for 80 Marks
-Internal Assessment of 1 Hour Examination for 20 Marks

There will be a 50 Marks examination for a course with 2 credits
The assessment of course with 2 credits will be as follow
-University Assessment of 2 Hours Examination for 40 Marks
-Internal Assessment of 0.5 Hour Examination for 10 Marks

Practical:
There will be a 100 Marks examination for a practical course with 4 credits
There will only an University Assessment of examination for 100 Marks
The examination will be conducted at the end of each semester

On Job Training:
There will be a 100 Marks examination
The distribution of Marks will be as follows
-Attendence at Workplace : 20
-Submission of Training Report : 30
-Preseantation on Training Report : 50

Research Project:
There will be a 100 Marks examination for a course with 4 credits at semester end
There will be a 150 Marks examination for a course with 6 credits at semester end, out of which University Assessment will be for 100 Marks and Internal Assessment of 50 Marks

11. Nature of Question Paper and Scheme of Marking

Theory:

A. University Assessment for 80 Marks

M. Sc. (Part - __) (Semester - ___) Examination
Food Science and Technology

Course Name (Course Code)

Day & Date: **Total Marks: 80**

Time:

Instructions: i. All questions carry equal marks
ii. Question No 1 is compulsory
iii. Attempt any 4 questions from Q 2 to Q7
iv. Figures to right indicates full marks

Q 1. Answer the following 16 Marks

There will be 16 question, of 1 Mark Each

This may include Multiple Choice Questions with 4 options and/or Fill in Blanks

Q. 2 One Long Answer Question 16 Marks

Q. 3 One Long Answer Question 16 Marks

Q. 4 Two Long Note Type Question of 8 Marks Each 16 Marks
a. _____ (8 Marks)
b. _____ (8 Marks)

Q. 5 Two Long Note Type Question of 8 Marks Each 16 Marks
a. _____ (8 Marks)
b. _____ (8 Marks)

Q. 6 Four Short Note Type Questions of 4 Marks Each 16 Marks
a. _____ (4 Marks)
b. _____ (4 Marks)
c. _____ (4 Marks)
d. _____ (4 Marks)

Q. 7 Four Short Note Type Questions of 4 Marks Each 16 Marks
a. _____ (4 Marks)
b. _____ (4 Marks)
c. _____ (4 Marks)
d. _____ (4 Marks)

Theory:

B. Internal Assessment for 20 Marks

M. Sc. (Part - __) (Semester - ___) Examination
Food Science and Technology

Internal Examination

Course Name:	**Course Code:**
Date:	**Time:**
Seat No.:	**Total Marks: ___ /20**

Instructions: i. All questions are compulsory
ii. Each question carries one mark

Q 1. Answer the following 20 Marks

There will be 20 question, of 1 Mark Each

This may include Multiple Choice Questions with 4 options and/or Fill in Blanks

Practical:

University Assessment for 100 Marks

Department of Food Science and Technology
Shivaji University, Kolhapur

M. Sc. (Part - __) (Semester - __)

Practical Examination

Course Name:	**Course Code:**
Date:	**Time:**
Seat No.:	**Signature:**

Q. 1. Principle Writing (Any 4 out off 6)	20 Marks
Q. 2. Performance of Experiment (Any One out off 2)	25 Marks
Q. 3. Performance of Experiment (Any One out off 2)	25 Marks
Q. 4. Journal	10 Marks
Q. 5. Viva-voce	10 Marks
Q. 6. Seminar	10 Marks

12. Equivalence of courses

M. Sc. Part I (Semester I and II)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
I	CC-103	Food Chemistry	4	**MSU0325MML917G1**	Food Chemistry	4
I	CC-102	Food Microbiology	4	**MSU0325MML917G2**	Food Microbiology	4
I	CC-101	Principles of Food Processing & Preservation	4	**MSU0325MEL917G1**	Principles of Food Processing & Preservation	4
I	CC-104	Biochemistry and Nutrition	4	**MSU0325MEL917G2**	Biochemistry and Nutrition	4
I	---	---	---	**MSU0325MML917G3**	Advance Instrumentation in Food Analysis	2
I	CCPR-105	Laboratory Course I	8	**MSU0325MMP917G**	Laboratory Course I	4
I	---	---	---	**MSU0325RML917G**	Research Methodology	4
II	CC-201	Principles of Food Engineering	4	**MSU0325MML917H1**	Food Engineering	4
II	DSE-404	Food Packaging	4	**MSU0325MML917H2**	Food Packaging	4
II	DSE-304	Food Quality and Safety Management	4	**MSU0325MEL917H1**	Food Quality and Safety Management	4
II	CCS-303	Food Additives, Contaminants and Toxicology	4	**MSU0325MEL917H2**	Food Additives, Contaminants and Toxicology	4
II	---	---	---	**MSU0325MML917H3**	Entrepreneurship Development in Food Processing	2
II	CCPR-205	Laboratory Course II	8	**MSU0325MMP917H**	Laboratory Course II	4
II	---	---	---	**MSU0325OJP917H**	On Job Training/Internship	4

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

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
III	CC-202	Cereal and Legume Technology	4	**MSU0325MML917I1**	Cereal and Legume Technology	4
III	CC-203	Fruit and Vegetable Technology	4	**MSU0325MML917I2**	Fruit and Vegetable Technology	4
III	CC-401	Technology of Oilseeds and Fats	4	**MSU0325MEL917I1**	Technology of Oilseeds and Fats	4
III	CCS-403	Post-harvest Technology of Plantation Crops	4	**MSU0325MEL917I2**	Post-harvest Technology of Plantation Crops	4
III	---	---	---	**MSU0325MML917I3**	New Food Product Development	2
III	CCPR-305	Laboratory Course III	8	**MSU0325MMP917I**	Laboratory Course III	4
III	---	---	---	**MSU0325RPP917I**	Research Project - Phase I	4
IV	CCS-302	Technology of Milk and Milk Products	4	**MSU0325MML917J1**	Technology of Milk and Milk Products	4
IV	CC-301	Technology of Meat, Fish and Poultry Products	4	**MSU0325MML917J2**	Technology of Meat, Fish and Poultry Products	4
IV	CC-204	Fermentation Technology	4	**MSU0325MEL917J1**	Fermentation Technology	4
IV	CCS-402	Food Biotechnology	4	**MSU0325MEL917J2**	Food Biotechnology	4
IV	CCPR-405	Laboratory Course IV	8	**MSU0325MMP917J**	Laboratory Course IV	4
IV	---	---	---	**MSU0325RPP917J**	Research Project - Phase II	6