

Estd. 1962

With CGPA 3.52

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SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४ ०२३१—२६०९४८७



SU/BOS/Science/09

Date: 02/01/2024

To,

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

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 (1.0) 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-II (Sem. III & IV) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

	M.Sc.Part-II (Sem. III & IV) as per NEP-2020 (1.0)								
1.	Computer Science	7.	Biochemistry (HM)						
2.	Data Science	8.	Biotechnology (HM)						
3.	Information Technology (Entire)	9.	Biotechnology						
4.	M.C.A.	10.	Medical Information Management						
5.	Food Science & Nutrition	11.	Environmental Science						
6	Food Science & Technology	12.							

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website <u>www.unishivaji.ac.in NEP-2020 (Online Syllabus)</u>

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. 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: The Dean, Faculty of Science & Technology 8 P.G. Admission/Seminar Section 1 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 2024-25)

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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)										
	TEA			HING SCHE	ME	EXAMINATION SCHEME					
	Course	TITLE OF THE PAPER	Theor	y and Praction	cal	University	Assessme	ent (UA)	Internal Assessment (IA)		
	Code		Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
	MMT-101	Food Chemistry	4	4	4	80	32	3	20	8	1
Major	MMT-102	Food Microbiology	4	4	4	80	32	3	20	8	1
Mandatory	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)											
			TEACHING SCHEME			EXAMINATION SCHEME					
SR. NO.	Course	TITLE OF THE PAPER	Theor	Theory and Practical			ty Assessm	ent (UA)	Intern	al Assessm	ent (IA)
	Code		Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours
	MMT-201	Food Engineering	4	4	4	80	32	3	20	8	1
Major	MMT-202	Food Packaging	4	4	4	80	32	3	20	8	1
Mandatory	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				
		Food Quality and Safety Management									
Major Elective	MET-205	OR	4	4	4	80	32	3	20	8	1
Elective		Food Additives, Contaminants and Toxicology									
OJT	OJT-206	On Job Training/Internship			4	100	40				
TOTAL											
	TOTAL (Sem I + Sem II)										
		Lec. : Lecture, Pract.: Prac	ctical, Ma	x.: Maximum	, Min.	: Minimum					

MMT – Major Mandatory Theory	• Total Marks for M.ScI : 1100					
MMPR – Major Mandatory Practical	• Total Credits for M.ScI (Semester I & II) : 44					
MET – Major Elective Theory	• Separate passing is mandatory for University and Internal					
MEPR – Major Elective Practical	Examinations					
RM - Research Methodology						
OJT/FP- On Job Training/ Field Project						
*Evaluation scheme for OJT/FP shall be decided by concerned BOS						
• Requirement for Entry at Level 6.0:						
Students with Bachelor Degree of 3 Years or 6 Semester program of	luration.					
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					
Requirement for Entry at Level 6.5:						
Students with Bachelor Degree (Honours/Research) of 4 Years or 8 Semester program duration.						

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)											
			TEACHING SCHEM				AE EXAMINATION SCHEME						
SR. NO.	Course	TITLE OF THE PAPER	Theor	Theory and Practical			y Assessm	ent (UA)	Internal Assessment (IA)		nt (IA)		
Six roo.	Code		Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours		
	MMT-301	Cereal and Legume Technology	4	4	4	80	32	3	20	8	1		
Major	MMT-302	Fruit and Vegetable Technology	4	4	4	80	32	3	20	8	1		
Wandatory	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						
		Technology of Oilseeds and Fats											
Major	MET-305	OR	4	4	4	80	32	3	20	8	1		
Elective		Post-harvest Technology of Plantation Crops											
RP	RP-306	Research Project - Phase I	4	8	4	100	40						
TOTAL													

		SEMESTER – IV (Duration – Six Month)											
			TEAC	TEACHING SCHEME					EXAMINATION SCHEME				
SR. NO.	Course	Course TITLE OF THE PAPER	Theor	Theory and Practical			y Assessm	ent (UA)	Internal Assessment (IA)				
	Code		Lec. / Pract. (per week)	Hours (per week)	Credits	Max. Marks	Min. Marks	Exam Hours	Max. Marks	Min. Marks	Exam Hours		
	MMT-401	Technology of Milk and Milk Products	4	4	4	80	32	3	20	8	1		
Major Mandatory	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	MET-404	Fermentation Technology											
Elective		OR	4	4	4	80	32	3	20	8	1		
		Food Biotechnology											
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.: Pra	actical, M	ax.: Maximun	n, Min	.: Minimum							

MMT – Major Mandatory Theory	• Total Marks for M.ScII : 1100					
MMPR – Major Mandatory Practical	• Total Credits for M.ScII (Semester III & IV) : 44					
MET – Major Elective Theory	• Separate passing is mandatory for University and Internal					
MEPR – Major Elective Practical	Examinations					
RP- Research Project						
# Evaluation scheme for Research Project shall be decided by concerned	ed BOS					
## Evaluation scheme for Research Project shall be decided by concern	ned 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

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I ne course	code for	VLSC FOO	a Science	and rechnol	ogy course	18 as ionows:
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	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				
0	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					
	MET-205 Food Quality and Safety Management (4 credit)	MSU0325MEL917H1				
6	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				
0	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					
E	MET-404 Fermentation Technology (4 credit)	MSU0325MEL917J1				
3	MET-404 Food Biotechnology (4 credit)	MSU0325MEL917J2				

8. Syllabus

M. Sc. Food Science and Technology (Part II) (Level-6.5) (Semester III) (NEP-2020) (Introduced from Academic Year 2024-25)

Title of Course: Cereal and Legume Technology Course Code: MSU0325MML917I1 Total Credits: 04

Course Outcomes:

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

-understand the structure of the grains and the components of commercial products

-understand the concepts of physiological characteristics of cereals and legumes

-gain knowledge in different processing of Cereals and legumes and also its value added products -identify the common faults and causes in cereal products

-understand quality attributes the laboratory techniques to assess grain and flour quality

Unit-1

(15 lectures)

Introduction to cereals, production trends, structure and nutrient distribution in cereals. Wheat types, milling of wheat, quality of flour and flour treatment.

Technology of bread, biscuits, cakes, durum wheat, breakfast cereals and extruded products. Unit-2 (15 lectures)

Corn-wet milling and dry milling. Corn starch and its hydrolyzed syrups. Corn flakes and Popcorn. Rice milling, milling machines, milling yield and rice quality, parboiling of rice, and rice products. Millet processing. Value Added Products from Millets (Nutri-Cereals).

Unit-3

(15 lectures)

Introduction to legumes, production trends, structure and nutrient distribution in legumes. Dhal milling and processing of pulses.

Post harvest processing of legume and pulses. Types of milling. Pre milling treatments.

Milling of individual pulses: Pigeonpea, Chickpea, Urdbean, Mungbean, Lentils etc. Unit-4 (15

(15 lectures)

Technology of cereal and legume based products. Traditional fermented cereal and legume based food products: Milk Substitute, Meat Analogue, Tofu, Miso, Temphe, Soy sauce, idli and dosa, dhokala. Instant food and premix.

Suggested Readings

Samuel A. Matz. 1991. Bakery Tech. and Engineering. Van Nostrand Reinhold Publisher, New York. Salunkhe, D.K., Kadam, S.S. Ed. 1989. Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3 vol. set). CRC Press, Florida.

EIRI Book. 2007. Breakfast, Dietary Food, Pasta & Cereal Products Technology (hand Book). Engineers India Research Ins. Publisher.

Chakraverty, A. 1988. Post-harvest Tech of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi. Mathews, R.H.1989. Legumes: Chemistry, Tech. and Human Nutrition. Marcel Dekker, New York. Pomeranz, Y. 1978. Wheat: Chemistry and Tech. Am. Assoc. of Cereal Chemist. St. Paul, Minnesota.

Title of Course: Fruit and Vegetable Technology Course Code: MSU0325MML917I2 Total Credits: 04 Course Outcomes:

Upon successful completion of this course, the student will be able to: -preserve the fruits and vegetables and their products results into availability of them in off season -store food material in perfect consumable condition for a longer time -use various methods for extending the shelf -life of fruits and vegetables -process the fruit and vegetables into value added products -identify the common faults and causes in fruits and vegetable product processing Unit-1 (15 lectures) Introduction to fruits and vegetable processing industry and market statistics. Structure, cellular components and composition of fruits and vegetables. Post harvest technology of fruits and vegetables: Harvesting, Handling, Processing. Principles and methods of fruit and vegetable preservation. Principles and methods of storage: natural, ventilated, low temperature storage, MAP, CAP. Unit-2 (15 lectures) Freezing and freeze-drying of fruits and vegetables. Drying and dehydration of fruits and vegetables. Irradiation of fruits and vegetables. Commercial canning of fruits and vegetables. Unit-3 (15 lectures) Fruit and Vegetable Juices, Fruit Syrups, Cordials and Nectars. Fruit preserve, Candies, Crystallized fruits and vegetables. Jams, Jellies, Marmalades. Pickles, Chutney, Sauces and Ketchup. Pectin and related compounds. Unit-4 (15 lectures) Beverage technology: Alcoholic, Non-alcoholic and carbonated beverages. Utilization of fruits and vegetable waste. Processing of mineral water and water standards for food processing plants.

Fruit product order and quality control.

Suggested Readings

Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Fruit Science and Technology:
Production, Composition and Processing. Marcel Dekker, New York.
Salunkhe, D.K. and Kadam, S.S. Ed. 1995. Handbook of Vegetable Science and Technology.
Production, Composition, Storage and processing Marcel Dekker, New York.
Srivastava, R.P. and Kumar, S. 1998. Fruit and Vegetable Preservation: Principles and Practices.
2nd Ed. International Book Distributing Co. Lucknow.
L. R. Verma and Dr. V. K. Joshi. 2000. Postharvest Technology of Fruits and Vegetables: General concepts and principles. Vol I and II. Indus Publishing Company, New Delhi.
W. V. Crusee. 2009. Commercial Fruit and Vegetable Products. Agrobios, India.
S. Rajarathnam and R. S. Ramteke. 2011. Advances in Pres and Proc Tech.of Fruits and Vegetables. NIPA Lal G., Siddappa G. and Tondon G. L. 1986. Preservation of Fruits and Vegetables, ICAR, New Delhi.

Title of Course: New Food Product Development Course Code: MSU0325MML917I3 Total Credits: 02

Course Outcomes:

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

-understand and discuss key concepts and principles concerning the role of food product and service innovation

-understand principles concerning the activities and competencies involved in new food product development

-gain the knowledge about range of tools and methods that are used to manage new food product development

-generate an ability to address costs issues through better design decisions.

Unit-1 (15)Lectures) New Product Development : Introduction and Scope. Fundamental elements and challenges in new product development. Importance of Product Innovation. Characteristics of Successful Product Development. Types of New Products. Process of New Product Development. Stages of NPD. Stage-Gate Process. Ideation and concept development, Scoping and Concept Testing Building a Business Case and Feasibility Study, Market Analysis, Prototyping, Development, Testing and Validation. Test Marketing, Positioning and Launching Process. Branding and Market Communication Unit-2 (15 Lectures) Process control parameters and scale-up. **Consumer Preference and Consumer Adoption Process** Product Life Cycle and Produce Performance Testing.

Commercialization. Marketing of Management.

Suggested Readings

Karl T. Ulrich and Steven D. Eppinger (2016). Product Design and Development. 6th Edition. McGraw-Hill Education, New York

Fadi Aramouni and Kathryn Deschenes (2015). Methods For Developing New Food Products - An Instructional Guide. DEStech Publications. Inc.

Christoph H. Loch and Stylianos Kavadias (2008). Handbook of New Product Development Management. Butterworth-Heinemann is an imprint of Elsevier Ltd, UK

Philip Kotler and Kevin Lane Keller (2006). Marketing Management. Prentice Hall Pub. New Jersey, U.S

Title of Course: Technology of Oilseeds and Fats Course Code: MSU0325MEL917I1 **Total Credits: 04 Course Outcomes:**

Upon successful completion of this course, the student will be able to: -understand the concepts of physiological characteristics of oil bearing materials (Plant and Animal Origin) -gain knowledge in different processing of oilseeds and oil extraction, and also its by-products -understand the work space, tool and equipment for post harvest technology of oilseeds -understand by-product process technique thorough understandings of the specific processing technologies

Unit-1	(15 lectures)
Commercial edible oil sources. Composition and characteristics of oilseeds, oils a	nd animal fats.
Handling and storage of oil bearing material. Pre-treatments for oilseeds.	
Unit-2	(15 lectures)
Methods of recovering oil and fats.	
Mechanical Oil Extraction – Traditional and Modern method. Oil Expeller	
Solvent Extraction - Principle and Types of extractors. Solvent characteristics for	oil extraction.
Rendering of Animal Fat – Lard and Tallow	
Unit-3	(15 lectures)
Refining of crude oil –	
Degumming, Neutralization, Washing, Drying, Bleaching, Winterization, Deodor	ization.
$Modification\ of\ oil-Fractionation,\ Winterization,\ Hydrogenation,\ Esterification.$	
Production of Hydrogenated Vegetable Fat and Margarine.	
Unit-4	(15 lectures)
Quality assessment of oils and fats. Factors affecting quality of oils and fats.	
Physical and chemical properties of oils and fats.	
Frying of food and reactions during frying of food.	
By-product utilization from oil industry – Production of Lecithin and Biodiesel.	

Suggested Readings

Shukla B. D., Srivastava P. K. and Gupta R. K. 1992. Oilseeds processing technology. CIAE, Bhopal Chakraverty A. 2010. Post harvest tech. of cereals, pulses and oilseeds. 3rd ed. Oxford & IBH Pub. Co. Pvt. Ltd., ND

NIIR Board of Consultants and Engineers. Modern Tech. of oil, fats and its derivatives. APBP Inc., Delhi EIRI Board of Consultants and Engineers. Hand Book of Oils, Fats And Derivatives with Refining and Packaging Technology. EIRI, New Delhi.

Title of Course: Post-harvest Technology of Plantation Crops Course Code: MSU0325MEL91712 Total Credits: 04 Course Outcomes:

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

-understand the concepts of physiological characteristics of plantation crops and spices

-gain knowledge in processing of plantation crops, spices, tea and coffee and also its value added products

-understand the work space, tool and equipment for post harvest technology plantation crops

-learn quality control and standardization of Post Harvest Technology of Plantation Crops

Unit-1	(15 lectures)
Plantation crops - Introduction and Importance.	
Value addition through processing.	
Processing of onion, garlic, ginger, turmeric, coconut	
Unit-2	(15 lectures)
Spices and condiments processing.	
Pepper, Chilli, Mace and Nutmeg, Asafoetida, Clove, Cardamom, Cinnamon, Saffron, Va	milla
Masala, Spice Blend, Spice Mix	
Unit-3	(15 lectures)
Natural food flavours.	
Extraction of essential oils and oleoresins.	
Methods- Steam/Water Distillation, Solvent/CO2/Cold Press/Microwave Extraction	
Unit-4	(15 lectures)
Sugar cane processing – Jaggery, Raw and Refined Sugar.	
Composition and processing of tea, coffee, cocoa.	
Cocoa butter, Cocoa Powder and Liquor and Chocolate manufacturing	

Suggested Readings

D. K. Salunkhe, and S. S. Kadam. 1998. Handbook of Vegetable Science and Tech. Marcel Dekker, NY, USA.

A. J. Taylor, R. S. T. Linforth. 2010. Food Flavour Technology. Wiley-Blackwell Publication. Iowa, USA.

K. V. Peter. 2006. Handbook of herbs and spices. Woodhead Publishing Limited. England

B. W. Minifie. 1999. Chocolate, Cocoa, and Confectionery: Science and Technology. Aspen Publishers

Title of Course: Laboratory Course III Course Code: MSU0325MMP917I Total Credits: 04 Course Outcomes:

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

-learn practically about the process involved in manufacturing different food products

-acquire practical skills required to assess the quality of products

-explain about requirements to prepare processed products from grains, fruits and vegetables etc.

Group - A

Determination of Gluten content Preparation and analysis of Bread Preparation and analysis of Biscuits Preparation and analysis of Cookies Preparation and analysis of Coke Preparation and analysis of Soymilk Preparation and analysis of Tofu Preparation and analysis of Idli Preparation and analysis of Dhokala Preparation and analysis of Popped Cereals

Group - B

Preparation and analysis of Fruit Juice and RTS Preparation and analysis of Squash Preparation and analysis of Jam Preparation and analysis of Jelly Preparation and analysis of Marmalade Preparation and analysis of Tomato Sauce /Tomato Ketchup Preparation and analysis of Tutti fruity / Amla Candy Preparation and analysis of Hard Boiled Candy Preparation and analysis of Fruit syrup /Synthetic syrup

Group - C1

Determination of melting point of fats Microscopic examination of fat crystals Estimation of Acid value of oil Estimation of Iodine value of oil Estimation of Saponification value of oil Preparation of peanut butter

Group - C2

Preparation of chocolate Analysis of Tea/Coffee Qualitative test for phytochemicals Estimation of caffeine Extraction of essential oil by steam distillation Separation of plant pigments by TLC

Title of Course: Research Project - Phase I Course Code: MSU0325RPP917I Total Credits: 04 Course Outcomes:

Upon successful completion of this course, the student will be able to: -understand ethical issues related to Research and Publication -build a strong foundation for future research work in a systematic manner -apply knowledge in solving the practical issues in the field of food research -identify the issues that must be addressed within the framework of the specific research area

The student will select a research topic and will conduct literature review on it. The topic will be based on students research interest and/or research area of research guide. The student will perform a minor research work just to check the feasibility of the research topic.

Title of Course: Technology of Milk and Milk Products Course Code: MSU0325MML917J1 Total Credits: 04	
Course Outcomes: Upon successful completion of this course, the student will be able to: -understand the concepts of physiological characteristics of milk and milk products -gain knowledge in processing of milk and also its value added products -scientifically undertake all operations of dairy technology -learn quality control and standardization of milk and milk products	
Unit-1 Introduction to Indian Dairy Industry. National Dairy Development Board (NDDB). Market milk. Constituents of milk and milk quality assessment. Physical, Chemical and Microbiological quality of milk.	(15 lectures)
Unit-2 Handeling, Collection, Transportation of milk. Full Cream Milk, Toned Milk, Skimmed Milk, Pasteurized milk Sterilized Milk, UHT Milk, Reconstituted Milk, Standardized Milk	(15 lectures)
Unit-3 Dried Milk – Whole Milk Powder (WMP) and Skimmed Milk Powder (SMP) Evaporated and Condensed Milk. Types of Khoa and manufacturing process. Coagulated milk products - Curd, Channa, Paneer, Cheese	(15 lectures)
Unit-4 Manufacturing of cream, butter, and butter oil Ice cream- Classification, composition, manufacturing process Indigenous milk and milk product – Rubri, Pedha, Burfi, Kulfi, Shrikhand, Lassi Cleaning and sanitation of dairy plant and equipment	(15 lectures)

Suggested Readings

De S. 2008. Outlines of Dairy Technology. Oxford University Press, New Delhi.
Walstra P., Geurts T. J., Noomen A., Jellema A and Boekel. 2005. Dairy Technology.
Principles of milk properties and processes. Marcel Dekker, Inc., New York.
R. C. Chandan, A. Kilara and N. P. Shah. 2008. Dairy processing and quality assurance.
S. Wiley-Blackwell Publication, Iowa, USA.
Handbook of milk processing, dairy products and packaging technology.
EIRI Board of Consultants and Engineers, Delhi.

Title of Course: Technology of Meat, Fish and Poultry Products	
Course Code: MSU0325MML917J2	
Total Credits: 04	
Course Outcomes:	
Upon successful completion of this course, the student will be able to: -understand about processing of meat, poultry and fish, value added products thereof	
-know about the nutritional profile of meat, poultry, fish and egg	
-gain knowledge on the methods of grading meat	
-understand different techniques available to slaughter animal, processing and preservatio	n of egg and fish
-learn quality control and standardization of meat, fish and poultry processing	
Unit-1	(15 lectures)
Introduction to animal product technology.	
Plant Layout, Design and Construction of an Abattoir	
Muscle Structure and composition of meat.	
Conversion of Muscle to Meat. Pre-slaughtering practices and slaughtering methods.	
Ante- and Post-mortem examination. Carcass grading and Cuts. Factors affecting meat qu	ality.
Unit-2	(15 lectures)
Classification of fish – Fresh Water and Marine Water, Fin Fish and Shell Fish.	
Commercially important fish. Structure and composition fish muscle.	
Handling, Storage and Transportation of Fresh Fish.	
Fish freshness and quality evaluation. Post-mortem changes in fish.	
Unit-3	(15 lectures)
Types and classes of Poultry - chickens, turkeys, ducks, geese, guineas, and pigeons.	
Classification of chicken. Poultry parts. Premortem handling, Transportation and Slaughte Poultry carcass evaluation.	ering.
Structure of Egg. Grading and quality evaluation of shell eggs.	
Unit-4	(15 lectures)
Tenderization of meat, Freezing and Thawing of meat, Curing of meat, Smoking of meat Fish processing- Freezing, Chilling, Curing, Drying and Dehydration, Canning, Smoking Egg processing- Liquid egg, Egg powder and desugarization of egg products.	

Suggested Readings

Fidel Toldra. 2010. Handbook of meat processing. Wiley-Blackwell Publication, Iowa, USA
Ranken M. D. 2000. Handbook of meat product technology. Blackwell Science Publication
Warriss P. D. 2000. Meat Science. CABI Publishing, UK
Isabel Guerrero-Legarreta. 2010. Handbook of Poultry Science and Technology. John Wiley & Sons, Inc., Pub.
Meat processing and meat products hand book. EIRI Board of Consultants and Engineers. New Delhi.
Preservation of meat and poultry products. NIIR Board of Consultants and Engineers. APBP Inc., Delhi
NPCS Board of Consultants and Engineers. The complete technology book on meat, poultry and fish processing.

Title of Course: Fermentation Technology Course Code: MSU0325MEL917J1 **Total Credits: 04 Course Outcomes:** Upon successful completion of this course, the student will be able to: -understand the basic principles of fermentation process and its applications in food processing -recognize the fundamentals of fermentation technology and assess modeling of bio-processes -distinguish bioreactor operations and scale-up of bioreactors -analyze the bio-process paradigm: Scale-down, simulation and economics -justify and analyze the problem associated to quality of fermented products Unit-1 (15 lectures) Origin and history of food fermentation. Range of fermentation process: biomass, enzymes, metabolites, colours and flavours Microbial growth kinetics: Batch Culture, Continuous Culture and Fedbatch Culture Types of fermentation sub-merged/solid state, Batch /continuous fermentation. Unit-2 (15 lectures) Fermenter design. Body construction, Ports, Sensor Probe, Valves Aeration and agitation system. Impellers, Baffels and Spargers. Sterilization of Fermenter, Air, Media and Exhaust gas. Unit - 3 (15 lectures) Operational measurement and quality control. Principles of downstream processes and product recovery. Effluent treatment. Unit -4 (15 lectures) Commercial production process for beer, wine and vinegar. Traditional fermented foods. Production of alcohols, organic acids, enzymes, colours and flavours. Fermentation economics.

Suggested Readings

Stanburry P. F., Whitaker A. And Hall S. J. 1995. Principles of Fermentation Tech.
2nd Ed. Pergamon Press, UK.
William C. Frazier, Dennis C. Westhoff. 2013. Food Microbiology. Mc Graw Hill India.
Y. H. Hui, Lisbeth Meunier-Goddik, Jytte Josephsen, Wai-Kit Nip, Peggy S. Stanfield. 2004.
Handbook of Food and Beverage Fermentation Technology. CRC Press
Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, New York.
Brian McNeil and Linda Harvey. 2008. Practical Fermentation Tech. John Wiley & Sons Ltd., England

Title of Course: Food Biotechnology Course Code: MSU0325MEL917J2 Total Credits: 04 Course Outcomes:

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

-learn about use of biotechnology in various fields (Plant and Animal)

-understand the use of biotechnology in food sector which helps in producing different products

-justify and analyze the problem associated to quality of genetically modified foods

-understand the techniques in food biotechnology theoretically

(15 lectures)
(15 lectures)
(15 lectures)
(15 lectures)

Suggested Readings

Kalidas Shetty, Gopinadhan Paliyath, Anthony Pometto and Robert E. Levin. 2006. Food Biotechnology.
2nd Edition. CRC Press, Taylor and Francis Group, Boca Raton, FL.
John E. Smith. 2009. Biotechnology. 5th edition. Cambridge University Press, New York
Crueger, W. and Crueger A. 1984. Biotechnology: A Textbook of Ind. Micro. Science Tech. Madison, USA.
Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation. Education Publ. New Delhi.
Knorr, D. 1982. Food Biotechnology. Marcel Dekker, New York.

Title of Course: Laboratory Course IV Course Code: MSU0325MMP917J Total Credits: 04 Course Outcomes:

Upon successful completion of this course, the student will be able to: -learn practically about the process involved in manufacturing different food products -acquire practical skills required to assess the quality of products -explain about requirements to prepare animal based processed products -study the practical aspects of food biotechnology

Group - A

Quality Evaluation of Milk (Plat Form Test) Determination of fat content of milk by Gerber's method Standardization of milk Fat and SNF Preparation of flavoured milk and its analysis Preparation and Analysis of Khoa, Pedha, Gulab jamun Preparation and Analysis of Channa, Rasogolla, Paneer Preparation and Analysis of Curd and Lassi Preparation and Analysis of Chakka (Hung Curd) and Shrikhand Determination of overrun in ice-cream

Group – B

Slaughtering and dressing of Poultry Bird Study of poultry meat cuts Physical quality evaluation of meat Determination of Water Holding Capacity and drip loss Determination of Extract Release Volume (ERV) Determination of Meat Swelling Capacity (MSC) External quality evaluation of egg Breakout test for internal quality evaluation of egg Evaluation of freshness of fish

Group – C1

Study of Fermenter/Bioreactor Preparation and analysis of Pickle Preparation and analysis of Wine Preparation and analysis of Sauerkraut Measurement of B.O.D. and C.O.D. Study of Gel Electrphorosis

Group – C2

Estimation of protein by using Biuret method Estimation of protein by using Lowry's method Preparation of explant Characterization of callus Study the sub culturing of the callus and Micro-propagation of plant Extraction of DNA Study of PCR Technique

Title of Course: Research Project - Phase II Course Code: MSU0325RPP917J Total Credits: 06 Course Outcomes:

Upon successful completion of this course, the student will be able to: -understand components of research project and project report -build a strong foundation for future research work in a systematic manner -provide a solution in solving the practical issues in the field of food research -work on the issues that must be addressed within the framework of the specific research area

The student will undertake a research project in the filed of food science and technology.

The student will perform a major research on the topic of students research interest under the supervision of research guide.

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

	Course Name (Course Cod	e)			
Day & Date: Total Marks: 80					
Time:					
Instructions:	i. All questions carry equal marksii. Question No 1 is compulsoryiii. Attempt any 4 questions from Q 2 to Q7iv. Figures to right indicates full marks				
Q 1. Answer t	he following	16 Marks			
There	will be 16 question, of 1 Mark Each				
This m	ay include Multiple Choice Questions with 4	options and/or Fill in Blanks			
Q. 2 One Long	g Answer Question	16 Marks			
Q. 3 One Long	g Answer Question	16 Marks			
Q. 4 Two Lon	g Note Type Question of 8 Marks Each	16 Marks			
a		(8 Marks)			
b		(8 Marks)			
Q. 5 Two Lon	g Note Type Question of 8 Marks Each	16 Marks			
a		(8 Marks)			
b		(8 Marks)			
Q. 6 Four Sho	rt Note Type Questions of 4 Marks Each	16 Marks			
a		(4 Marks)			
b		(4 Marks)			
c		(4 Marks)			
d		(4 Marks)			
Q. 7 Four Sho	rt Note Type Questions of 4 Marks Each	16 Marks			
		(4 Marks)			
а					
a b		(4 Marks)			
a b c		(4 Marks) (4 Marks)			

Theory:

B. Internal Assessment for 20 Marks

Internal Exami	nation
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	

Practical:

University Assessment for 100 Marks

Department of Food Science and Technology Shivaji University, Kolhapur M. Sc. (Part) (Semester) Practical Examination		
Course Name: Date: Seat No.:	Course Code: Time: 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

Old Course			Equivalent Course			
Sem No.	Course Code	Title of Old Course	Credit	Course Code	Title of New Course	Credit
Ι	CC-103	Food Chemistry	4	MSU0325MML917G1	Food Chemistry	4
Ι	CC-102	Food Microbiology	4	MSU0325MML917G2	Food Microbiology	4
Ι	CC-101	Principles of Food Processing & Preservation	4	MSU0325MEL917G1	Principles of Food Processing & Preservation	4
Ι	CC-104	Biochemistry and Nutrition	4	MSU0325MEL917G2	Biochemistry and Nutrition	4
Ι				MSU0325MML917G3	Advance Instrumentation in Food Analysis	2
Ι	CCPR-105	Laboratory Course I	8	MSU0325MMP917G	Laboratory Course I	4
Ι				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 I (Semester I and II)

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	MSU0325MEL91712	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