

SU/BOS/Science/497

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

M.Sc.Part-II (Sem. III & IV) as per NEP-2020			
1.	Microbiology (HM)	8.	Food Science & Nutrition
2.	Pharmaceutical Microbiology (HM)	9.	Food Science & Technology
3.	Microbiology	10.	Biochemistry
4.	Computer Science	11.	Biotechnology
5.	Computer Science (Online Mode)	12.	Medical Information Management
6.	Data Science	13.	Environmental Science
7.	Information Technology (Entire)	14.	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



NAAC with 'A++' Grade with CGPA 3.52

Syllabus as per New Education Policy

for

M. Sc. Part-II (Food Science and Technology)

Semester III and IV

Department of Food Science and Technology

(Syllabus to be implemented from June 2023)

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
M.Sc. (Food Science and Technology) Programme Structure
M.Sc. Part – I (Level-8)

SEMESTER-I (Duration- Six Month)											
Type	Sr. No.	Course Code	Teaching Scheme			University Assessment (U/A)			Examination Scheme		
			Theory and Practical		Credit	Maximum Marks	Minimum Marks	Exam. Hours	Internal Assessment (IA)		
			Lectures (Per week)	Hours (Per week)					Maximum Marks	Minimum Marks	Exam. Hours
CGPA	1	CC-101	4	4	4	80	32	3	20	8	1
	2	CC-102	4	4	4	80	32	3	20	8	1
	3	CC-103	4	4	4	80	32	3	20	8	1
	4	CC-104	4	4	4	80	32	3	20	--	*
	5	CCPR-105	16	16	8	200	80	--	--	80	--
Total (A)			--	--	24	520	--	--	80	20	2
Non-CGPA	1	AEC-106	2	2	2	--	--	--	50	--	--
SEMESTER-II (Duration- Six Month)											
CGPA	1	CC-201	4	4	4	80	32	3	20	8	1
	2	CC-202	4	4	4	80	32	3	20	8	1
	3	CC-203	4	4	4	80	32	3	20	8	1
	4	CC-204	4	4	4	80	32	3	20	80	*
	5	CCPR-205	16	16	8	200	80	--	--	80	--
Total (B)			--	--	24	520	--	--	80	20	2
Non-CGPA	1	SEC-206	2	2	2	--	--	--	160	--	--
Total (A+B)											

<ul style="list-style-type: none"> • Student contact hours per week : 32 Hours (Min.) 	<ul style="list-style-type: none"> • Total Marks for M.Sc.-I : 1200
<ul style="list-style-type: none"> • Theory and Practical Lectures : 60 Minutes Each 	<ul style="list-style-type: none"> • Total Credits for M.Sc.-I (Semester I & II) : 48
<ul style="list-style-type: none"> • CC-Core Course • CCPR-Core Course Practical • AEC-Mandatory Non-CGPA compulsory Ability Enhancement Course • SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course 	<ul style="list-style-type: none"> • Practical Examination is annual. • Examination for CCPR-105 shall be based on Semester I Practicals. • Examination for CCPR-205 shall be based on Semester II Practicals. • *Duration of Practical Examination as per respective BOS guidelines • <i>Separate passing is mandatory for Theory, Internal and Practical Examination</i>
<ul style="list-style-type: none"> • Requirement for Entry at Level 8: Completed all requirements of the relevant Bachelor's degree (Level 7) with principal / major subjects..... 	
<ul style="list-style-type: none"> • Exit Option at Level 8: Students can exit after Level 8 with Post Graduate Diploma in if he/she completes the courses equivalent to minimum of 48 credits. 	

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
M.Sc. (Food Science and Technology) Programme Structure
M.Sc. Part – II (Level-9)

SEMESTER-III (Duration- Six Month)													SEMESTER-IV (Duration- Six Month)			
Type	Sr. No.	Course Code	Teaching Scheme			University Assessment (U/A)				Examination Scheme						
			Theory and Practical	Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours				
CGPA	1	CC-301	4	4	4	4	80	32	3	20	8	1				
	2	CCS -302	4	4	4	4	80	32	3	20	8	1				
	3	CCS-303	4	4	4	4	80	32	3	20	8	1				
	4	DSE -304	4	4	4	4	80	32	3	20	8	1				
	5	CCPR-305	16	16	8	8	200	80	--	--	--	*				
Total (C)			--	--	24	520	--	--	80	--	--	2				
Non-CGPA	1	AEC-306	2	2	2	2	--	--	--	50	20					
	2	EC (SWM MOOC)-307	Number of lectures and credit shall be as specified on SWAYAM MOOC													
SEMESTER-IV (Duration- Six Month)																
CGPA	1	CC-401	4	4	4	4	80	32	3	20	8	1				
	2	CCS -402	4	4	4	4	80	32	3	20	8	1				
	3	CCS-403	4	4	4	4	80	32	3	20	8	1				
	4	DSE -404	4	4	4	4	80	32	3	20	8	1				
	5	CCPR-405	16	16	8	8	200	80	--	--	--	*				
Total (D)			--	--	24	520	--	--	80	--	--	--				
Non-CGPA	1	SEC-406	2	2	2	2	--	--	--	50	20	2				
	2	GE-407	2	2	2	2	--	--	--	50	20	2				
Total (C+D)						48	1040	--	--	160	--	--				

	M.Sc.-I	M.Sc.-II	Total
Marks	1200	1200	2400
Credits	48	48	96

Student contact hours per week : 32 Hours (Min.)	
• Theory and Practical Lectures : 60 Minutes Each	• Total Marks for M.Sc.-II : 1200
<ul style="list-style-type: none"> • CC-Core Course • CCS- Core Course Specialization • CCPR-Core Course Practical and Project • DSE-Discipline Specific Elective • AEC-Mandatory Non-CGPA compulsory Ability Enhancement Course • SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course • EC (SWM MOOC) - Non-CGPA Elective Course • GE- Multidisciplinary Generic Elective 	<ul style="list-style-type: none"> • Total Credits for M.Sc.-II (Semester III & IV) : 48 • Practical Examination is annual. • Examination for CCPR-305 shall be based on Semester III Practicals. • Examination for CCPR-405 shall be based on Semester IV Practicals. • *Duration of Practical Examination as per respective BOS guidelines • <i>Separate passing is mandatory for Theory, Internal and Practical Examination</i>
<ul style="list-style-type: none"> • Requirement for Entry at Level 9: Completed all requirements of the relevant Post Graduate Diploma (Level 8) in • Exit at Level 9: Students will exit after Level 9 with Master's Degree in if he/she completes the courses equivalent to minimum of 96 credits. 	

I. CGPA course:

1. There shall be 14 Core Courses (CC)per programme.
2. There shall be 04 Core Course Specialization (CCS)of 16 credits per programme.
3. There shall be 02 Discipline Specific Elective (DSE) courses of 08 credits per programme
4. Total credits for CGPA courses shall be of 96 credits per programme

II. Mandatory Non-CGPA Courses:

1. There shall be 02 Mandatory Non-CGPA compulsory Ability Enhancement Courses (AEC) of 02 credits each per programme.
2. There shall be 01 Mandatory Non-CGPA compulsory Skill Enhancement Course (SEC) of 02 credits per programme.
3. There shall be one Elective Course (EC) (SWAYAM MOOC). The credits of this course shall be as specified on SWAYAM MOOC.
4. There shall be one Generic Elective (GE) course of 02 credits per programme. Each student has to take generic elective from the department other than parent department.
5. The total credits for Non-CGPA course shall be of 08 credits + 2.4 credits of EC as per availability.
6. The credits assigned to the course and the programme are to be earned by the students and shall not have any relevance with the work load of the teacher.

Department of Food Science and Technology

M. Sc. Food Science and Technology

Pos, PSOs and COs

Program Outcomes (POs)	
PO1	Post Graduates will have an ability to apply knowledge of Food Science, Food Processing, Food Engineering and Technology
PO2	Post Graduates 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
PO3	Post Graduates 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
PO4	Post Graduates will have an ability to express practical proficiency in the field of food analysis, food processing and food preservation
PO5	Post Graduates will have advanced knowledge of food microbiology, food science, food engineering, food quality and food processing technology
PO6	Post Graduates 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
PO7	Post Graduates 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
PO8	Post Graduates will have an ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Post Graduates will have an ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	Post Graduates will have an ability to communicate effectively for self development
PO11	Post Graduates will have knowledge of industrial economics and management of food industries
PO12	Post Graduates 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

Program Specific Outcomes (PSOs)	
PSO1	Post Graduates will apply the knowledge of food chemistry, food preservation, food processing and food packaging for the effective utilization of agricultural commodities to develop healthy and nutritious foods
PSO2	Post Graduates will design economically feasible equipments for the modernization of traditional food processing methods
PSO3	Post Graduates will apply the knowledge of food engineering and technology principles from the various aspects of food technology and related disciplines to solve practical and real-world problems

Course Name	Course Outcomes (CO's)	
CC-101: Principles of Food Processing and Preservation	CO1	Understanding of the need for food preservation and processing.
	CO2	Understanding of the different preservation technique
	CO3	Knowledge of the principles of food spoilage and the ways to prevent
	CO4	Understanding of identification & selection of appropriate processing equipments and preservation methods for the specific foods
	CO5	Knowledge indirect approaches to food preservation: packaging, hygienic design, sanitation, GMP
	CO6	Understanding of SOPs and SSOPs during laboratory exercise.
CC-102: Food Microbiology	CO1	Be able to understand and identify the various microbes associated with foods and food groups.
	CO2	Enable students to understand and use various microbiological techniques for the study of foods.
	CO3	Be able to understand and identify the role of this microbe in food spoilage, food preservation.
	CO4	be able to acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems.
	CO5	Understand the methods used to detect pathogens in foods.
	CO6	Enable students to understand the methods of isolating and characterizing various microbes associated with foods and food groups.
CC-103: Food Chemistry	CO1	The chemistry of food to control a chemical and biochemical reaction that influence food quality
	CO2	The principles behind analytical techniques associated with food components and related problems
	CO3	The role of food nutrients and its use for preservation of food (concepts emphasized in a laboratory experiment)
	CO4	To study the basic nutrients and their requirements for human nutrition
	CO5	Evaluate new product development.
	CO6	Demonstrate practical proficiency in a food analysis laboratory.
CC-104: Biochemistry and Nutrition	CO1	Better understanding in physiological and metabolic functions of nutrients
	CO2	Familiarize nutritional assessment, RDA and Dietary Recommendations & guidelines
	CO3	Understanding and determining BMR and body surface area
	CO4	Understanding of food composition and energy balance in dietary planning
	CO5	Effective understanding of diet plan formulation for health and for nutrition-related disorders.
	CO6	Identifying appropriate techniques for Biochemical analysis of blood, urine

CC-201: Principles of Food Engineering	CO1	Understanding the basic principles of various food unit operations and its applications in food processing
	CO2	Knowledge of the food processing equipments used for the different unit operations.
	CO3	Understanding and practical experience of equipments, & how various unit operations work individually and together.
	CO4	Understanding of the calculations of mass balance and energy balance of food processes
	CO5	The students understood the importance of Food Process Engineering as one of the major pillars of Food Sci. and Tech. discipline.
	CO6	Obtain knowledge in application of scientific principles in the processing technologies specific to the materials.
	CO7	Develop an ability to identify, formulate, and solve engineering problems
CC-202: Cereal and Legume Technology	CO1	Understand the structure of the grains (Cereals and Legumes) and the components of commercial products
	CO2	Better understanding of the concepts of physiological characteristics of cereals and legumes
	CO3	Able to gain knowledge in different processing of Cereals and legumes and also its value added products.
	CO4	Identify the common faults and causes in cereal products
	CO5	Understand quality attributes the laboratory techniques to assess grain and flour quality
	CO6	Thorough Knowledge and understandings of the specific processing technologies used for different cereals and legumes and products
CC-203: Fruit and Vegetable Technology	CO1	Preserving the fruits and vegetables and their products results into availability of them in off season.
	CO2	Bi-products can be prepared from fruits and vegetables.
	CO3	Storage of food material in perfect consumable condition for a longer time without undergoing any spoilage can be possible.
	CO4	By the use of various methods shelf -life of fruits and vegetables can be extended and used as material for processing units.
	CO5	Processing gives value addition to fruit and vegetables due to which cash crop farmers get more income from the field.
	CO6	Identify the common faults and causes in fruits and vegetable product processing
CC-204: Fermentation Technology	CO1	Application of biological and engineering principles to problems involving microbial and biological/biochemical systems.
	CO2	Understand the work space, tool and equipment for fermented products
	CO3	Understanding the basic principles of fermentation process and its applications in food processing
	CO4	Recognize the fundamentals of fermentation technology and Assess modeling of bioprocesses
	CO5	Distinguish bioreactor operations and scale-up of bioreactors
	CO6	Analyze the bioprocess paradigm: Scale-down, simulation and economics, sterilization, and bio-burden in biological manufacturing
	CO7	Justify and analyze the problem associated to quality of fermented products

Course Name	Course Outcomes (CO's)
CC-301: Technology of Meat, Fish and Poultry Products	CO1 Able to understand about processing of meat, poultry and fish, preparation of different types of products from meat, poultry and fish.
	CO2 Students will get to know about the nutritional profile of meat, poultry, fish and egg
	CO3 Gain knowledge on the methods of grading meat
	CO4 Different techniques available to slaughter animal
	CO5 Processing and preservation of egg and fish
	CO6 Quality control and standardization of meat, fish and poultry
CCS-302: Technology of Milk and Milk Products	CO1 Train students to scientifically undertake all operations of dairy technology and to create employment potential and man power for dairy development
	CO2 To create entrepreneur in milk and milk products
	CO3 To develop organizational capabilities among our youth in milk and milk product industry
	CO4 To develop skill, instill confidence by enhancing life skills
	CO5 To increase nutritional status and income of community through dairy farming
CCS-303: Food Additives, Contaminants and Toxicology	CO1 Better understanding of the functions of different food additives in improving shelf life, texture and other physical and sensory characteristics of foods
	CO2 Exposure about food additives related to bakery and confectionary
	CO3 Exposure about types and chemical properties of pigments, flavouring compounds and their processing effect.
	CO4 Provide students with a basic understanding of the principles of food toxicology
	CO5 Identification of appropriate techniques for analysis of additives
	CO6 Recognize the common analytical techniques for detection of food adulterant
DSE-304: Food Quality and Safety Management	CO1 Develop a HACCP plans for different food industries
	CO2 Understanding knowledge of HACCP certification
	CO3 Understand laws and regulations governing food safety principles (FSMS and HACCP)
	CO4 Understand industry food safety requirements and certifications :organic, halal, kosher, GFSI, SQF (SQF implementation certification)
	CO5 Understand auditing and different auditing schemes, and be able to complete internal (first party) audits
	CO6 Presents ideas in written, graphic and oral form using computer software where appropriate

CC-401: Technology of Oilseeds and Fats	CO1	Better understanding of the concepts of physiological characteristics of oil bearing materials (Plant and Animal Origin) and lipids thereof
	CO2	Able to gain knowledge in different processing of oilseeds and oil extraction, and also its by-products.
	CO3	Understand the work space, tool and equipment for post harvest technology of oilseeds, oil extraction and refining of oil
	CO4	Able to acquire a confidence to get placement in any kind of oilseeds processing industry with minimum post harvest losses
	CO5	Understanding by-product process technique
	CO6	Thorough knowledge and understandings of the specific processing technologies, and analytical methods for quality evaluation
CCS-402: Food Biotechnology	CO1	Understanding knowledge regarding use of biotechnology in various fields (Plant and Animal)
	CO2	Understanding knowledge regarding use of biotechnology in food sector which helps in producing different products
	CO3	Understanding biotechnology helps in understanding the microbiology
	CO4	Fermented food technology helps to prepare various healthy products
	CO5	Upstream and downstream Processing Improvement Techniques can be helpful in production of various nutrients and medicines
	CO6	Understanding of microbial contents
CCS-403: Post Harvest Technology of Plantation Crops	CO1	Better understanding of the concepts of physiological characteristics of plantation crops and spices
	CO2	Able to gain knowledge in different processing of plantation crops, spices, tea and coffee and also its value added products
	CO3	Understand the work space, tool and equipment for post harvest technology plantation crops, spices, tea and coffee
	CO4	Get placed in any kind of plantation crops, spices, tea, & coffee, industry with minimum post harvest losses and maximum benefit to the industry.
	CO5	Thorough knowledge and understandings of the specific processing technologies used for different foods products derived from these materials
	CO6	Quality control and standardization of Post Harvest Technology of Plantation Crops
DSE-404: Food Packaging	CO1	Better Understandings of the various properties of food packaging materials
	CO2	Ability to Select suitable packaging material for different food substances
	CO3	Describe the role and function of packaging materials used for a range of consumer food needs and wants
	CO4	Relate the properties of food packages to conversion technologies, processing and packaging technologies and user requirements including safety, convenience and environmental issues.
	CO5	Describe the technology involved in the production, shaping and printing of various packaging materials and package
	CO6	Understanding why different materials are used for different purposes.

M. Sc. FOOD SCIENCE AND TECHNOLOGY STRUCTURE (CBCS PATTERN) (2019-20)

M. sc. Part – I

TYPE	SR. NO.	COURSE CODE	TITLE OF THE PAPER	SEMESTER – I (Duration – Six Month)								
				TEACHING SCHEME			EXAMINATION SCHEME					
				Theory and Practical			University assessment (UA)			Internal Assessment (IA)		
				LECTURES (per week)	HOURS (per week)	CREDITS	MAX. MARKS	MINI. MARKS	EXAM. HOURS	MAX. MARKS	MINI. MARKS	EXAM. HOURS
CGPA	1	CC-101	Principles of Food Processing & Preservation	4	4	4	80	32	3	20	8	1
	2	CC-102	Food Microbiology	4	4	4	80	32	3	20	8	1
	3	CC-103	Food Chemistry	4	4	4	80	32	3	20	8	1
	4	CC-104	Biochemistry and Nutrition	4	4	4	80	32	3	20	8	1
	5	CCPR-105	Laboratory Course I	16	16	8	200	80	---	---	---	*
Total (A)				---	---	24	520	---	---	80	---	---
Non-CGPA	1	AEC-106	Communicative English - I	2	2	2	---	---	---	50	20	2
SEMESTER – II (Duration – Six Month)												
	1	CC-201	Principles of Food Engineering	4	4	4	80	32	3	20	8	1
	2	CC-202	Cereal and Legume Technology	4	4	4	80	32	3	20	8	1
	3	CC-203	Fruit and Vegetable Technology	4	4	4	80	32	3	20	8	1
	4	CC-204	Fermentation Technology	4	4	4	80	32	3	20	8	1
	5	CCPR-205	Laboratory Course II	16	16	8	200	80	---	---	---	*
Total (B)				---	---	24	520	---	---	80	---	---
Non-CGPA	1	SEC-106	Fundamentals of Information Technology - I	2	2	2	---	---	---	50	20	2
Total (A + B)						48	1040	---	---	160	---	---

M. Sc. FOOD SCIENCE AND TECHNOLOGY STRUCTURE (CBCS PATTERN) (2019-20)

M. sc. Part – II

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)		
				LECTURES (per week)	HOURS (per week)	CREDITS	MAX. MARKS	MINI. MARKS	EXAM. HOURS	MAX. MARKS	MINI. MARKS	EXAM. HOURS
CGPA	1	CC-301	Technology of Meat, Fish and Poultry Products	4	4	4	80	32	3	20	8	1
	2	CCS-302	Technology of Milk and Milk Products	4	4	4	80	32	3	20	8	1
	3	CCS-303	Food Additives, Contaminants and Toxicology	4	4	4	80	32	3	20	8	1
	4	DSE-304	Food Quality and Safety Management	4	4	4	80	32	3	20	8	1
	5	CCPR-305	Laboratory Course III	16	16	8	200	80	---	---	---	*
Total (C)				---	---	24	520	---	---	80	---	---
Non-CGPA	1	AEC-306	Communicative English - II	2	2	2	---	---	---	50	20	2
	2	EC	SWAYAM/MOOCs/Online	Number of lectures and credits will be as specified on SWAYAM / MOOC Course / Online Courses								
SEMESTER – IV (Duration – Six Month)												
	1	CC-401	Technology of Oilseeds and Fats	4	4	4	80	32	3	20	8	1
	2	CCS-402	Food Biotechnology	4	4	4	80	32	3	20	8	1
	3	CCS-403	Post-Harvest Technology of Plantation Crops	4	4	4	80	32	3	20	8	1
	4	DSE-404	Food Packaging	4	4	4	80	32	3	20	8	1
	5	CCPR-405	Laboratory Course IV	16	16	8	200	80	---	---	---	*
Total (D)				---	---	24	520	---	---	80	---	---
Non-CGPA	1	SEC-406	Fundamentals of Information Technology - II	2	2	2	---	---	---	50	20	2
	2	GE-407	Food Analysis and Quality Control	2	2	2	---	---	---	50	20	2
Total (C + D)						48	1040	---	---	160	---	---

COURSE CONTENT

CC-301: Technology of Meat, Fish and Poultry Products (4 credits, 60 lectures)

Unit-1 (1credit, 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 quality.

Unit-2 (1credit, 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 (1credit, 15 lectures)

Types and classes of Poultry - chickens, turkeys, ducks, geese, guineas, and pigeons.
Classification of chicken. Poultry parts. Premortem handling, Transportation and Slaughtering.
Poultry carcass evaluation.
Structure of Egg. Grading and quality evaluation of shell eggs.

Unit-4 (1credit, 15lectures)

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., New Jersey
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. NPCS. Delhi

CC- 302: Technology of Milk and Milk Products

(4 credits, 60 lectures)

Unit-1

(1 credit, 15 lectures)

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.

Factors affecting composition of milk.

Unit-2

(1 credit, 15 lectures)

Handling, Collection, Transportation of milk.

Full Cream Milk, Toned Milk, Skimmed Milk, Pasteurized milk

Sterilized Milk, UHT Milk, Reconstituted Milk, Standardized Milk

Unit-3

(1 credit, 15 lectures)

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

Unit-4

(1 credit, 15 lectures)

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

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. Wiley-Blackwell Publication, Iowa, USA.

Handbook of milk processing, dairy products and packaging technology. EIRI Board of Consultants and Engineers, Delhi.

CC-303: Food Additives, Contaminants and Toxicology

(4 credits, 60 lectures)

Unit-1

(1 credit, 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

(1 credit, 15 lectures)

Natural food additive (Vitamins, Minerals, Pigments, Amino Acids, Essential Fatty Acids).

Food fortification and supplementation.

Fat substitute and replacers.

Sweeteners.

Unit-3

(1 credit, 15 lectures)

Sequestering and chelating agents.

Emulsifying, Stabilizing and Thickening agents.

Antioxidants. Antifoaming and Anticaking agents.

Desiccants and Humectants.

Unit-4

(1 credit, 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. New York

T. Shibamoto and L. F. Bjeldanes. 1993. Introduction to Food Toxicology. Academic Press, Inc. California

DSE-304: Food Quality and Safety Management**(4 credits, 60 hours)****Unit-1****(1 credit, 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**(1 credit, 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, Voluntary Standards: BIS and AGMARK

Structure and salient features of FSSA, 2006. Food Licensing and Registration.

Unit-3**(1 credit, 15 lectures)**

Food Quality Management System – International Organization for Standardization (ISO)

Food Safety Management System – HACCP, ISO 22000, FSSC, BRC, PRPs (GAP, GMP, GHP etc.)

Codex Alimentarius Commission, WHO, FAO, WTO, USFDA

Export (Quality Control and Inspection) Act, Custom Act, Import Control regulation

Unit-4**(1 credit, 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

CCPR-305 Laboratory Course III

(4 credits, 60 hours)

Group – A

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 pH

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 - B

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

Group - C

Estimation of Chlorophyll content
Estimation of Carotenoid Content
Separation of plant pigments by TLC
Determination of Sodium Benzoate Content
Determination of Salt Content
Study of relative sweetness of sweeteners
Estimation of tyrosine value
Estimation of Thiobarbituric acid value

Group - D

Sensory evaluation methods
Determination of overrun in ice-cream
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

Visit to Food Processing Plant-

Abattoir/Slaughter House/Poultry Farm/Fish Processing/Milk and Milk Products etc.

AEC-306 Communicative English - II

(2 credits, 30 hours)

EC SWAYAM/MOOCs/Online

Number of lectures and credits will be as specified on SWAYAM / MOOC Course / Online Courses

CC-401 Technology of Oilseeds and Fats

(4 credits, 60 lectures)

Unit-1

(1credit, 15 lectures)

Commercial edible oil sources.

Composition and characteristics of oilseeds, oils and animal fats.

Handling and storage of oil bearing material.

Pre-treatments for oilseeds.

Unit-2

(1credit, 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

(1credit, 15 lectures)

Refining of crude oil –

Degumming, Neutralization, Washing, Drying, Bleaching, Winterization, Deodorization.

Modification of oil – Fractionation, Winterization, Hydrogenation, Esterification.

Production of Hydrogenated Vegetable Fat and Margarine.

Unit-4

(1credit, 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 technology of cereals, pulses and oilseeds. 3rd edition. Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi

NIIR Board of Consultants and Engineers. Modern technology 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.

CCS-402 Food Biotechnology

(4 credits, 60 lectures)

Unit-1

(1credit, 15 lectures)

Basic principles of molecular biology and biotechnology.

Introduction to Genetics. Gene transfer mechanisms, Mutation, Types of mutations.

Recombinant DNA Technology – Tools and Techniques.

Unit-2

(1credit, 15 lectures)

Introduction to tissue culture techniques.

Plant cell, tissue and organ culture.

Animal cell and organ culture.

Applications of tissue culture.

Unit-3

(1credit, 15 lectures)

Industrial Biotechnology – GMOs, Bioengineered food, Bioremediation

Genetically Modified Food (GMF) - Concept, Types and Applications.

Regulations concerning GMF in India and at the International level.

Unit-4

(1credit, 15 lectures)

Bioinformatics- Introduction, Tools and Biological Database.

Computational structural biology.

Nano-biotechnology- Production and application of nano-particles.

Biosensors and novel tools and their application in food science.

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 Industrial Microbiology. Science Tech. Madison, USA.

Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation, (2 Vol. set). Education Publ. New Delhi.

Knorr, D. 1982. Food Biotechnology. Marcel Dekker, New York.

CCS-403 Post-Harvest Technology of Plantation Crops

(4 credits, 60 lectures)

Unit-1

(1credit, 15 lectures)

Plantation crops - Introduction and Importance.

Value addition through processing.

Processing of onion, garlic, ginger, turmeric, coconut

Unit-2

(1credit, 15 lectures)

Spices and condiments processing.

Pepper, Chilli, Mace and Nutmeg, Asafoetida, Clove, Cardamom, Cinnamon, Saffron, Vanilla

Masala, Spice Blend, Spice Mix

Unit-3

(1credit, 15 lectures)

Natural food flavours.

Extraction of essential oils and oleoresins.

Methods- Steam/Water Distillation, Solvent/CO₂/Cold Press/Microwave Extraction

Unit-4

(1credit, 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 Technology. Marcel Dekker, New York, 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

DSE-404 Food Packaging

(4 credits, 60 lectures)

Unit-1

(1credit, 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

(1credit, 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

(1credit, 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

(1credit, 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.

Suggested Readings

G. L. Robertson. 2006. Food Packaging: Principles And Practice. CRC Press, Taylor and Francis 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. & Prof. Chapman & Hall, Glasgow

CCPR-405 Laboratory Course IV

(4 credits, 60 hours)

Group - A

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
Extraction of essential oil by steam distillation
Preparation of peanut butter
Preparation of chocolate
Qualitative test for phytochemicals
Estimation of caffeine

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
Study of PCR
Study of Gel Electrophoresis

Group – C Research Project Work

Visit to Food Processing Plants –

Oil Industry/Packaging Industry/Spices Processing/Tissue Culture Lab

SEC-406 Fundamentals of Information Technology – II

(2 credits, 30 hours)

GE-407 Food Analysis and Quality Control

(2 credits, 30 hours)

Unit-1

(10 Lectures)

Introduction to Food Analysis and Quality Control. Scope and Importance

Composition of Food. Types of Food Products.

Sampling techniques and preparation of Sample.

Physical analysis of Food. pH, weight, volume, density, specific gravity, size, thickness.

Advanced instrumentation for physical analysis. Texture Analysis, Viscosity Analysis, Color Analysis

Unit-2

(10 Lectures)

Chemical analysis of Food.

Preparation of standard solutions.

Moisture, Crude Protein, Crude Fat, Total Minerals, Total Carbohydrates.

Spectrophotometry/Chromatography/Flame Photometry for chemical analysis of food

Unit-3

(10 Lectures)

Introduction to Food Microbiology.

Media Preparation, Sterilization and Inoculation Techniques.

Methods for microbial examinations of foods. TPC, Yeast and Mold Count, MPN, Dye Reduction Test

Sensory Analysis of Food. Introduction to sensory organs and senses.

Olfaction and Gustation. Methods of sensory analysis.