Program Structure
Program: M.Sc. (Food Science and Technology)
Program Code: SBR0413
Batch: 2018-20
Department of Life Sciences
School of Basic Science & Research

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. **Transformative educational experience**
2. **Enrichment by educational initiatives that encourage global outlook**
3. **Develop research, support disruptive innovations and accelerate entrepreneurship**
4. **Seeking beyond boundaries**

Core Values

- **Integrity**
- **Leadership**
- **Diversity**
- **Community**

1.2 Vision and Mission of the School

Vision of the School

Achieving Excellence in the Realm of Basic and Applied Sciences to Address the Global Challenges of Evolving Society

Mission of the School

1. **To equip the students with knowledge and skills in basic and applied sciences.**
2. **Capacity building through advanced training and academic flexibility.**
3. **To establish centre of excellence for ecologically and socially innovative research.**
4. **To strengthen inter institutional and industrial collaboration for skill development and global employability.**

Core Values

1. Passion
2. Perseverance
3. Scientific nature
4. Yearning for truth

1.2 Vision and Mission of the Department

Vision of the Department

To acquire and impart knowledge of biology and bio-techniques so as to build capacity for addressing current global challenges

Mission of the Department

1. **To train and transform students into thinking researchers/ professionals who are able to integrate theoretical knowledge and analytical skills in diverse areas of Biotechnology.**
2. **To make students and faculties updated with advance techniques and to introduce the students to dynamic environment of bioscience**
3. **To conduct cutting-edge interdisciplinary research.**
4. **To introduce various skill development courses thereby enhancing the employability and providing opportunities for industry-academia collaboration.**

1.3 Programme (Specilization in Food Science and Technology) Educational Objectives (PEO)

1.3.1 Writing Programme Educational Objectives (PEO)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

PEO1: Postgraduate will be able to integrate advanced Food Science and Technology concepts through theoretical knowledge and experimental techniques.

PEO2: Postgraduate students to lay emphasis on new discoveries and interdisciplinary nature of research in the field of food technology so that students are motivated to take up research in the form of higher studies or industrial projects.

PEO3: Postgraduate enhance the morden practical knowledge of the students by teaching them latest Food Quality analysis advanced techniques and to make them learn the use of these techniques for competitive examinations ,betterment of society and food safety.

PEO4: Postgraduate students will be industry- or academia-ready by inculcating professional ethics, independent thinking, good communication and scientific skills in the students.

PEO5: Postgraduate students strengthen the analytical skills and research aptitude of students through continuous learning and by assigning them presentation/ case studies and project work.

1.3.2 Map PEOs with School Mission Statements:

PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1:	3	2	2	1
PEO2:	2	2	3	2
PEO3:	2	3	3	1
PEO4:	2	2	2	3
PEO5:	1	1	2	1

1.3.2.1 Map PEOs with Department Mission Statements:

PEO Statements	Department Mission 1	Department Mission 2	Department Mission 3	Department Mission 4
PEO1:	3	2	2	2
PEO2:	3	2	3	2
PEO3:	2	3	2	3
PEO4:	2	1	1	2
PEO5:	2	1	2	2

1.3.3. Program Outcomes (PO's)

PO1. Knowledge and Skill Set: Students will become proficient in understanding various food preservation techniques and processes. The student will be skilled in latest interdisciplinary Industrial level technical knowledge which will be beneficial for their future research/ employment.

PO2. Research: Students will be able to independently think and identify a research problem, design experimental protocols to address that problem and analyse statically the results or solutions emanating out of his/ her work.

PO3. Oral Communication and Scientific Writing: Students will develop sound oral communication skills. They will be able to make and deliver effective presentations. The students will be able to comprehend and write project report/ reviews and / research articles through enhanced learning, reading and writing skills.

PO4. Food technology, Environment and Society: Student will be able to understand the impact of Food technology on environment and society. Students will be capable of addressing different problems related to food safety and food preservation for food security. Students will be able to develop scientific data and could provide support for Industrial Research and Development with new innovations and techniques applied in food preservation.

PO5. Ethics: The students will develop and understand the importance of professional ethics. Students will be able to understand the issue of plagiarism in research and importance of copyrights. Students will also gain knowledge about various ethical issues associated with Patent filling.

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

Mapping	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	3	2	2	3	2
PO2	2	3	2	2	3
PO3	1	1	1	3	2
PO4	2	2	3	1	2
PO5	2	2	1	3	1

1.3.5 Program Outcome Vs Courses Mapping Table:

1.3.5.1 COURSE ARTICULATION MATRIX

Cos	PO1	PO2	PO3	PO4	PO5
MFS 101	3	3	2	1	-
MFS 102	3	3	2	1	-
MFS 103	3	3	2	3	3
MFS 104	3	2	2	1	-
MFP 104	3	2	1	-	-
MFP 105	3	3	2	1	1
MFP106	3	3	2	2	1
MFS 105	3	3	2	1	-
MFS 106	3	3	2	3	3
MFS 152	3	3	2	3	2
MFS 153	3	2	2	2	-
CCU401	3	2	2	2	-
MFS 201	3	2	2	1	-
MFS 202	3	3	2	1	-
MFS 203	3	3	2	3	2
MFS 251	3	3	2	3	1
MFS 252	2	1	2	3	3
MFS 204	3	3	2	2	3
MFS 205	3	3	2	2	3
MFS 253	3	2	2	1	3

SUMMARY SHEET

Teaching Department: Life Science
School: School of Basic Sciences and Research
Programme: M.Sc. (Food Science and Technology)

Duration: Two Years

Total number of Credits : 86

TERM: I

S. No.	Paper ID	Subject Code	Subjects	Teaching Load			Credits
				L	T	P	
THEORY SUBJECTS							
1.	30055	MST 111	Biostatistics	2	0	0	2
2.	30377	MFS 101	Nutrition Biochemistry	4	0	0	4
3.	30378	MFS 102	Advanced Food Processing	4	0	0	4
4.	30379	MFS 103	Advanced Food Chemistry	4	0	0	4
5.	30604	MFS 104	Technology of Fruits Vegetables and Plantation Crops	4	0	0	4
Practical/Viva-Voce/Jury							
6.	30473	MFP 104	Advanced Food Processing Lab	0	0	3	2
7.	30474	MFP 105	Advanced Food Biochemistry Lab	0	0	3	2
8.	30605	MFP 106	Food Preservation Lab	0	0	3	2
TOTAL CREDITS							**24**

TERM: II

S. No.	Paper ID	Subject Code	Subjects	Teaching Load			Credits
				L	T	P	
THEORY SUBJECTS							
1	30407	MSB121	Fermentation Technology	4	0	0	4
2	30410	MFS105	Advanced Food Safety and Toxicology	4	0	0	4
3	30411	MFS 106	Advanced Food Biotechnology	4	0	0	4
4	30268	MMB 204	Food Microbiology	4	0	0	4
5	30399	MSB 120	Bioinformatics	2	0	0	2
PRACTICALS							
6	30413	MFS153	Advanced Food Biotechnology Lab	0	0	3	2
7	30548	MFS154	Advanced Food Microbiology Lab	0	0	3	2
8	30661	MFS155	Advanced Food Safety and Toxicology Lab	0	0	3	2
						TOTAL	**24**

TERM: III

S. No.	Paper ID	Subject Code	Subjects	Teaching Load			Credits
				L	T	P	
THEORY SUBJECTS							
1.	30486	MFS 201	Food Quality and Assurance	4	0	0	4
2.	30487	MFS 202	Technology of Meat, Poultry and Fish Products	4	0	0	4
3.	30488	MFS 203	Waste Management in Food Industries	4	0	0	4
4.	30846	MFS206	Techniques in Food Analysis	4	0	0	4
Practical/Viva-Voce/Jury							
5.	30489	MFS 251	Dissertation - I	0	0	4	2
6.	30490	MFS 252	Food Quality and Assurance Lab	0	0	2	2
7.	30847	MFP202	Meat Technology Lab	0	0	2	2
TOTAL CREDITS							**22**

TERM: IV

S. No.	Paper ID	Subject Code	Subjects	Teaching Load			Credits
				L	T	P	
THEORY SUBJECTS							
1.	30545	MFS 204	Bakery , confectionary and extruded products	4	0	0	4
2.	30546	MFS 205	Technology of plant derived Foods	4	0	0	4
PRACTICALS							
3.	30547	MFS253	Dissertation II	0	0	16	8
TOTAL							**16**

MST111: BIO-STATISTICS
L-T-P: 2-0-0 **Credits: 2**

School: SBSR		**Batch: 2018-2020**
Program: M. Sc.		**Current Academic Year: 2018-19**
Branch: (Food Science and Technology)		**Semester: Odd (1st)**
1	Course Code.	MST111
2	Course Title	BIO-STATISTICS
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course status	Compulsory
5	Course Objectives	To make students familiar with the concept of Probability and Statistics with emphasis on some standard probability distributions and sampling distributions.
6	Course Outcomes	CO1: Describe the concept of Statistics and statistical inference and calculate find the measures of central tendency and dispersion of a data. (K1,K2,K3) CO2: Explain the concept of probability and evaluate the probability of various events in a random experiment, theorem on probability, conditional probability. (K2,K4,K5) CO3: Discuss the concept of random variable and its distributions for evaluate relevant probabilities. (K1,K2,K5) CO4: Discuss about confidence interval and evaluate population parameters from the statistics of samples.(K1,K2,K5) CO5: Explain and evaluate statistical hypothesis using large and small samples. (K2,K4,K5)
7	Course Description	In this introductory statistics course we will explore the use of statistical methodology in designing, analyzing, interpreting, and presenting biological experiments and observations. We will cover descriptive statistics, probability, and hypothesis testing and statistical inference.
8	Outline syllabus:	

UNIT 1	**Introduction and descriptive statistics.**	CO Mapping
A	Representation of data: Frequency distribution, Measures of central tendency, mean, median, mode and mean of combined data.	CO1
B	Dispersion: mean deviation, standard deviation	CO1
C	Moments, Skewness and Kurtosis.	CO1
UNIT 2	**Probability.**	
A	Random experiment, sample space, events.	CO2
B	Mutually exclusive events, independent events, conditional probability.	CO2
C	Baye's theorem.	CO2
UNIT 3	**Random variables and its Distribution.**	
A	Random variables, expectation and variance of a random variable.	CO3

B	Binomial Distribution.			CO3
C	Normal Distribution			CO3
UNIT 4	**Sampling Distribution**			
A	Sampling distribution of sample mean (Small Sample).			CO4
B	Sampling distribution of difference of two sample means (Small Sample).			CO4
C	Sampling distribution of sample means and difference of two sample means (large samples).			CO4
UNIT 5	**Testing of hypothesis.**			
A	Testing of hypothesis: single population mean for small sample.			CO5
B	Testing of hypothesis: difference of two population means for small sample.			CO5
C	Testing of hypothesis: single population mean and difference of two population means for large sample.			CO5
	Mode of Examination	Theory		
	Weightage distribution	CA	MTE	ETE
		30%	20%	50%
	Text books	1. Gupta, S.C and Kapoor, V.K, "Fundamental of Mathematical Statistics".		
	Other references	1. Daniel, Wayne W.,"Biostatistics": Basic concept and Methodology for Health Science. 2. Grewal, B.S, "Higher Engineering Mathematics". 3. Probability and Statistics for Engineers and Scientists, Walpole R. E., Mayers R. H., S. I., Ye. K. 7th Edition, Pearson, 2002. 4. Statistics for Biologists, Campbell R. C., Cambridge University Press 1988. 5. The Principles of Scientific Research, Freedman P., Pergamon Press, New York.		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS101: Nutrition Biochemistry
L-T-P: 4-0-0 Credits: 4

School: SBSR	**Batch: 2018-2020**		
Program: M. Sc.	**Current Academic Year: 2018- 19**		
Branch: (Food Science and Technology	**Semester: Odd (1st)**		
1.	Course number	**MFS101**	
2	Course Title	**Nutrition Biochemistry**	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
5	Course Objective	From this course students will be able to learn about classification and structure of carbohydrates, amino acids, proteins, metabolic pathways, enzymes and its role in digestion, absorption, utilization and storage. To understand different role of nutrition in day today life.	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1. Identify different sources and types of carbohydrates, amino acids, proteins and their role in nutrition. CO2. To examine of the following: a) Omega – fatty acids b) Phospholipids c) Cholesterol in the body d)MUFA and PUFA CO3. To identify the role of metabolic pathways and enzymes in energy, digestion, absorption, utilization and storage. CO4. Compare different techniques used for identification of nutrition in health and their application. CO5. Review the future perspectives and importance of nutrition Biochemistry in food technology.	
7	Outline syllabus:		
7.01	XXXNNN.A	**Unit A**	**Carbohydrates**
7.02	XXXNNN.A1	Unit A Topic 1	Classification and structure of carbohydrates
7.03	XXXNNN.A2	Unit A Topic 2	Digestion, absorption, utilization and storage, sources of carbohydrates
7.04	XXXNNN.A3	Unit A Topic 3	Role of fibre in lipid metabolism
7.05	XXXNNN.B	**Unit B**	**Lipids and Amino acids**
7.06	XXXNNN.B1	Unit B Topic 1	Classification, structure and functions of amino acids, lipids
7.07	XXXNNN.B2	Unit B Topic 2	Identification of embryonic stem cells
7.08	XXXNNN.B3	Unit B Topic 3	Properties of embryonic stem cells
7.09	XXXNNN.C	**Unit C**	**Metabolic Pathways and Enzymes**
7.10	XXXNNN.C1	Unit C Topic 1	Glycolysis and TCA cycle
7.11	XXXNNN.C2	Unit C Topic 2	Meat tenderization-process parameters and enzymes linked
7.12	XXXNNN.C3	Unit C Topic 3	Methods to enhance tenderization, Flatulence causing sugars.

7.13	XXXNNN.D	**Unit D**	**Nutrition in Health**
7.14	XXXNNN.D1	Unit D Topic 1	Basal and Resting Metabolic rate and caloric needs
7.15	XXXNNN.D2	Unit D Topic 2	Requirements and role of nutrients in human health, RDA for different age groups, Biological value of food
7.16	XXXNNN.D3	Unit D Topic 3	Measurement of energy expenditure, Techniques of health surveys. Formulation of diets and food products for specific needs
8	Course Evaluation		
8.1	CA: 30% marks		
8.2	MTE	20%	
8.3	End-term examination: 50%		
9	References		
9.1	Text book	1.Tom Brody "Nutritional Biochemistry" Second edition 2004, University of California Academic Press	
9.2	Other References	1. Stryer L., "Biochemistry", W. H. Freeman, 2010. 2. Christa van Tellingen, M.D. 2001."B Biochemistry from a phenomenological point of view".	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS102: Advanced Food Processing (theory Subject)

L-T-P: 4-0-0 **Credits: 4**

School: SBSR	**Batch: 2018-2020**	
Program: M. Sc.	**Current Academic Year: 2018- 19**	
Branch: (Food Science and Technology	**Semester: Odd (1st)**	
1.	Course Code	MFS102
2	Course Title	Advanced Food Processing
3	Credits	4

4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objectives	• To develop a sense of advanced food processing technologies of food products • To use traditional methods to know about type techniques used in products packaging • To have an overview of the various methods involved in the post- harvest technologies of food. • To develop a working knowledge of the use of food quality in different segments of technology applications.	
6	Course Outcomes	CO1: Comprehend the advanced concept of Food Processing and Preservation. CO2: Develop the understanding for food conversion. CO3: Understand the different methodology used to preserve the food. CO4: Develop knowledge for food packaging and scope of food processing. CO5: Understand the industrial approach for food processing.	
7	Course Description	Food processing is an application of various technologies employs on food manufacture Industries and in Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food processing could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different methods in assessment of food products.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	**CO1,CO5**
	A	Introduction to Food Processing, Food raw materials: physical, functional and geometric properties	CO1,CO5
	B	Cleaning of raw materials: cleaning methods and contaminations	CO1,CO5
	C	Principles of Preservation methods, fermentation methods for preservation, and chemical preservations of foods	CO1,CO5
	Unit 2	**Food Conversion**	**CO2,CO5**
	A	Mixing and emulsification	CO2,CO5
	B	Filtration and membrane separation: principles, design features and general applications, Centrifugation methods principles and applications	CO2,CO5
	C	Solid-liquid extraction and expression methods.	CO2,CO5
	Unit 3	**Food Preservation**	**CO3,CO5**
	A	Food preservation by low temperature: Refrigeration, freezing and freeze drying, Food	CO3,CO5

		preservation by heating: drying, osmotic dehydration			
	B	Blanching, canning pasteurization, sterilization, extrusion cooking			CO3,CO5
	C	Non-thermal preservation: Hydrostatic pressure, dielectric heating, microwave processing, hurdle technology, membrane technology, irradiation			CO3,CO5
	Unit 4	**Food Packaging and Scope of Food Processing**			**CO4,CO5**
	A	Food storage: storage conditions and packaging (materials, filing, closing and sealing equipment)			CO4,CO5
	B	Microbiological considerations in Food processing, Methods of heat sterilization in containers. Pasteurization by heat processing			CO4,CO5
	C	Scope and importance of food processing: national and international perspectives.			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. JG Brenman, AS Grandison, Food Processing Handbook 2011 Wiley YCH Publications 2. Fellows, P. and Ellis H. 1990. Food Processing Technology: Principles and Practice, New York.			
	Other References	1. Lewis, M.J. 1990. Physical Properties of Food and Food Processing Systems 2. Woodhead, UK. Wildey, R.C. Ed. 1994. Minimally Processed Refrigerated Fruits and Vegetables. Chapman and Hall, London.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2

CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS103: Advanced Food Chemistry (theory Subject)

L-T-P: 4-0-0 **Credits: 4**

School: SBSR		**Batch : 2018-2020**	
Program: M.Sc.		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester: Odd (1st)**	
1	Course Code	MFS103	
2	Course Title	Advanced Food Chemistry	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objectives	1. To develop the scientific approach in students about the food chemistry. 2. To develop the expertise for advances in food chemistry.	
6	Course Outcomes	After successfully completion of this course students will be able to: **CO1.** Understand the importance of food chemistry, carbohydrates and enzymatic browning. **CO2.** Understand the chemistry of protein and lipids. **CO3.** Understand the chemistry of vitamins, minerals and importance of water activity in food chemistry. **CO4.** Understand the chemistry of food flavours and pigments with their importance in food industry and their safety evaluation. **CO5.** Understand the advances in food chemistry.	
7	Course Description	Advanced Food chemistry is the advanced study of chemical processes and interactions of the biological and non-biological components of foods. It overlaps with biochemistry in that it deals with the components of food such as carbohydrates, lipids, proteins, water, vitamins, and dietary minerals. In addition, it involves the study of food pigments and flavour.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	**CO1, CO5**
	A	Food chemistry-definition and importance.	**CO1, CO5**
	B	Carbohydrates-chemical structure and properties, functional properties of sugars and polysaccharides in foods.	**CO1, CO5**
	C	Enzymatic browning-chemical reaction, industrial application.	**CO1, CO5**
	Unit 2	**Proteins and Lipid chemistry**	**CO2, CO5**
	A	Protein and amino acids: structure, classifications, sources,	**CO2, CO5**

		denaturation and functional properties of proteins.	
	B	Maillard browning. Lipids: classification, and use of lipids in foods.	**CO2, CO5**
	C	Physical and chemical properties, effects of processing on functional properties.	**CO2, CO5**
	Unit 3	**Vitamins and Minerals Chemistry**	**CO3, CO5**
	A	Vitamins and Minerals-sources, functions and deficiency disorders, Effect of processing on vitamins and minerals.	**CO3, CO5**
	B	Industrial applications of enzymes	**CO3, CO5**
	C	Water in food, water activity and shelf life of food, classification of food commodities on the basis of ease of spoilage.	**CO3, CO5**
	Unit 4	**Food Flavours and Safety**	**CO4, CO5**
	A	Natural food flavor-characterization	**CO4, CO5**
	B	Pigments in food and their industrial applications,	**CO4, CO5**
	C	Safety evaluation of Food flavours and pigments.	**CO4, CO5**
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Fennema. Ed. 1976. Principles of Food Science: PartI Food Chemistry. Marcel Dekker, New York. 2. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.	
	Other References	1. Westport. Birch, G.G., Cameron, A.G. and Spencer, M. 2005 Food Science, 3rd Ed. Pergamon Press, New York.	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS104: Technology of Fruits, Vegetables and Plantation Crops

L-T-P: 4-0-0 **Credits: 4**

School: SBSR		**Batch : 2018-2020**	
Program: M. Sc		**Current Academic Year: 2018-19**	
Branch: Food Science and technology		**Semester: Odd (1st)**	
1	Course Code	MFS104	
2	Course Title	Technology of Fruits, Vegetables and Plantation Crops	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	The course is designed to prepare students with a basic understanding of food processing and preservation techniques involved in food sciences. The course provides a foundation for introduction of various important topics of food sciences.	
6	Course Outcomes	At the end of the course, students will be able to: CO1.Explain the processing fruit and vegetable based products. CO2.Recognize the thermal and non-thermal methods of food processing. CO3.Apply the use of dehydration techniques in food preservation. CO4.Review potential applications of Plantation crops processing in food technology. CO5.Analayze the importance and role of packaging in food products. CO6.Decribe properties of different packaging materials used in different food products.	
7	Course Description	This course has been designed to make student understand the processing technology used for preservation of fruits and vegetables.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Importance of fruits and vegetable, history and need of preservation, Reasons of spoilage, Method of preservation (short & long term).	CO1,CO6
	B	Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature.	
	C	Containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.	
	Unit 2	**Processing of fruit and related products**	
	A	Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, sugars, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder.	C02,CO5

	B	Introduction, Jam: Constituents, selection of fruits, processing & technology Jelly, Essential constituents (Role of pectin, ratio), Theory of jelly, formation, Processing & technology, defects in jelly			CO1,CO3
	C	Marmalade : Types, processing & technology, defects			
	Unit 3	**Processing of vegetables and related products**			
	A	Processing of pickles, chutneys and sauces.			CO1,C02,C03
	B	Causes of spoilage in pickling , pulping			
	C	Processing of tomato juice, Tomato products, tomato puree, paste, ketchup, sauce and soup.			
	Unit 4	**Dehydration of fruits and vegetables**			
	A	Sun drying & mechanical dehydration process variation for fruits and vegetables.			CO3,CO5,CO6,CO4
	B	Packing			
	C	Storage			
	Unit 5	**Technology of plantation crops**			
	A	Processing and properties of major and minor spices,			CO4,CO5,CO6
	B	Essential oils & oleoresins, adulteration.			
	C	Tea, coffee and cocoa processing, variety and products.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 vol. Set). AVI, Westport.			
	Other References	2. Bender, A.E. 1978. Food Processing and Nutrition. Academic Press, London. 3. Kadar, A. A. 1992. Postharvest Technology of Horticultural Crops. 2nd Ed. University of California. 4. Srivastava, R.P. and Kumar, S. 1998. Fruit and Vegetable Preservation: Principles and Practices. 2nd Ed. International Book Distributing Co. Lucknow.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFP-104: Advanced Food Processing Lab

L-T-P: 0-0-2 **Credits: 2**

School: SBSR		**Batch: 2018-2020**	
Program: Life-Sciences		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester: Odd (1st)**	
1	Course Code	MFP-104	
2	Course Title	Advanced Food Processing Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory Course	
5	Course Objective	• To develop a sense of advanced food processing technologies of food products • To use traditional methods to know about type techniques used in products packaging • To have an overview of the various methods involved in the post harvest technologies of food. • To develop a working knowledge of the use of food quality in different segments of technology applications.	
6	Course Outcomes	CO1: Comprehend the basic concept of Food Processing CO2: Develop idea for purpose of this in food preservation. CO3: Different methodology used to identify various biological hazards and their control measures in food processing CO4: Various internal and external factors involved in of Food Quality and self-life of products. CO5: Recognize the importance and utility of techniques in Food quality and in food Industry.	
7	Course Description	Food processing is an application of various technologies employs on food manufacture Industries and in Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food processing could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different methods in assessment of food products.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on Hurdle Technologies**	**CO1,CO2**
		Preservation of food using High temp (heating)	
		Preservation using Low temp (chilling/freezing)	
		Preservation using Drying/Curing/use of additives	
	Unit 2	**Practical related to Osmotic Technologies**	**CO1,CO3**
		Osmotic dehydration of fruits (Papaya/Guvava)	
		Evaluation of chemical properties of osmotic dehydrated products	

		Evaluation of sensory properties of osmotic dehydrated products.			
	Unit 3	**Practical related to--- Rheology and Viscosity**			**CO1,CO3**
		Rheological properties of flour			
		Rheological properties of milk			
		Rheological properties of semi-solid food product			
	Unit 4	**Practical related to---Evaluation to Biological Hazard**			**CO1,CO3**
		Estimation of total plate count using pour plate method			
		Estimation of total plate count using streak plate method			
		Estimation of Yeast and mould count in food sample			
	Unit 5	**Practical related to---Implementation of technologies in various methods of product development on Food Industries**			**CO2,CO3**
		Development of Guavas jelly			
		Development of tomato puree			
		Development of tomato ketchup			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	-------	40%	
	Text book/s*	1. Srivastava, R.P. and Kumar, S. 1998. Fruit and Vegetable Preservation: Principles and Practices. 2nd Ed. International Book Distributing Co. Lucknow.			
	Other References	1. Desrosier, N.W. and Desrosier, J.N. (1998).The Technology of Food Preservation. New Delhi: CBS Publication			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFP-105: Advanced Food Biochemistry Lab
L-T-P: 0-0-2 **Credits: 2**

School: SBSR	**Batch: 2018-2020**				
Program: Life-Sciences	**Current Academic Year: 2018-19**				
Branch: Food Science	**Semester: Odd (1st)**				
1.	Course Code	MFP105			
2	Course Title	Advanced Food Biochemistry Lab			
3	Credits	2			
4	Contact Hours (L-T-P)	0-0-3			
6	Course Outcomes	CO1: Comprehend the basic concept of Food biochemistry and microbiology CO2: Gain knowledge of idea for techniques in Food Biochemistry CO3: To gain knowledge of biochemistry of raw meat, poultry CO4: To acquire the knowledge about biochemistry of milk constitutes CO5: To visualize the growth of microbes in food samples with the help of microscope.			
8	Outline syllabus				
	Unit 1	**An Introduction to Food Biochemistry Lab**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Analytical Techniques in Food Biochemistry**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Biochemistry of Raw Meat and Biochemistry of Raw Poultry**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Biochemistry of Milk Constituents and Biochemistry of Fruits**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Biochemistry and Probiotics**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	• Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	-	40%	
	Text book/s*	Serna-Saldivar, S. O. (2012). *Cereal grains: Laboratory Reference and Procedures Manual*. CRC Press.			
	Other References	R. Saravanan, D. Dhachinamoorthi, CH. MM. Prasada Rao			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFP-106: Food Preservation Lab

L-T-P: 0-0-2 **Credits: 2**

School: SBSR		**Batch: 2018-2020**
Program: Life-Sciences		**Current Academic Year: 2018-19**
Branch: Food Science And Technology		**Semester: 1**
1	Course Code	MFP-106
2	Course Title	Food Preservation Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory Course
5	Course Objective	• To develop a sense of food preservation of food products • To use traditional methods to know about type preservation methods used in products • To have an overview of the various new methods involved in the self-life extension in food. • To develop a working knowledge of the use of new product development of food.
6	Course Outcomes	CO1: Comprehend the basic concept of Food preservation. CO2: Develop idea for purpose of this in food shelf-life.. CO3: Different methodology used to identify various biological hazards and their control measures in food processing CO4: Various internal and external factors involved in of Food Quality and self-life of products. CO5: Recognize the importance and utility of waste as new product by Food preservation techniques in food Industry.
7	Course Description	Food preservation is an application of various post-harvest technologies employs on food manufacture Industries and in new product development. The types of hazards during processing identification are beneficial in food

		preservation. In the future Food Preservation could offer more depth knowledge with shelf-life studies of food. In this course, students will learn about the different methods in assessment of new food product development.			
8	Outline syllabus				CO Mapping
	Unit 1	**Practical based on basic preservation techniques.**			**CO1,CO2**
	A	Food preservation with sugar			
	B	Food preservation with			
	C	Preservation of food using thermal techniques			
	Unit 2	**Practical related to –Post harvest Technologies available**			**CO1,CO3**
	A	Canning of fruits/vegetables			
	B	Sorting and grading of fruits/vegetables			
	C	Quality evaluation of packaged food.			
	Unit 3	**Practical related to Physical, Chemical Hazards Evaluation**			**CO1,CO3**
	A	Identification of physical Hazard			
	B	Identification of Chemical Hazard			
	C	Detection of common adulterants food commodities			
	Unit 4	**Practical related to---New Product Development Techniques**			**CO1,CO3**
	A	Preparation of fruit preserves (jam/jelly)			
	B	Preparation of vegetable preserves (pickle)			
	C	Fruit pulping / juice / beverage preparation			
	Unit 5	**Practical related to---Implementation of Sensory assessment Methods on Food Products**			**CO2,CO3**
	A	Discriminative Test			
	B	Triangular Test/Duo-Trio Tests/Paired Comparison Tests			
	C	Hedonic Rating Scale			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	------	40%	
	Text book/s*	- Food Science			
	Other References	Lab manual of sensory evaluation			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2

CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MSB 121: Fermentation Technology

L-T-P: 3-1-0 Credits: 4

School: SBSR		**Batch : 2018-2020**	
Program: MSc		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester: 2 (Even)**	
1	Course Code	**MSB 121**	
2	Course Title	**Fermentation Technology**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. To enable students bridge the gap between theoretical concepts and practical aspects in fermentation technology. 2. To provide knowledge about the different processes being used to prepare various industrially important substances 3. To enable students to understand the bioreactor designs. 4. To provide insight of various industrial fermentation process.	
6	Course Outcomes	CO1: Understand the history of fermentation technology and growth kinetics of microorganisms. CO2: Design bioreactors to achieve desired results (i.e. specified cell concentration, production rates, etc). CO3: Examine the mass transfer operation of various biochemical processes. CO4: Apply scale-up methods for increasing yield. Justify the use of different biochemical strategies for the production of biologicals.	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1		**CO1**
	A	History of fermentation industry, Introduction to submerged and solid state fermentation	
	B	Microbial culture selection for fermentation processes, Nutrient requirements for microbial growth	
	C	Growth kinetics of microbes, Sterilization of media and equipments for fermentation	
	Unit 2		
	A	Operational design of Bioreactor, Types of Bioreactors- CSTR, Airlift fermenter, Fluidized bed reactor, Packed bed reactor, Immobilized cells and enzymes	CO2, CO3
	B	Bio-reaction, Bio-separation	
	C	Fermentation processes- Batch, Continuous and Fed batch mode	

	Unit 3				**CO2, CO3, CO4**
	A	Measurement, monitoring and control of chemical parameters in a bioreactor			
	B	Transport phenomena			
	C	Rheology, Oxygen transfer			
	Unit 4				**CO2, CO3, CO4**
	A	Aeration and agitation in bioreactors, Gassing requirements for bioreactor working			
	B	Oxygen demand measurement, Measurements of dissolved oxygen concentration			
	C	Scale up and scale down methods for bioreactors			
	Unit 5				**CO3, CO4**
	A	Cell suspensions, Characteristics of cell suspensions			
	B	Design and handling of plant cell bioreactor, Design and handling of animal cell bioreactor			
	C	Production of Penicillin, citric acid and glutamic acid			
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	-------	40%	
	Text book/s*	**1.** McNeil B. and Harvey L., "Practical Fermentation Technology", Wiley, 2008.			
	Other References	**2.** Doran P.M., "Bioprocess Engineering Principles", Academic Press, 2012. **3.** Katoh S. and Yoshida F., "Biochemical Engineering", Wiley-VCH, 2009.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS105: Advanced Food Safety and Toxicology (Theory Subject)

L-T-P: 3-1-0 Credits: 4

School: SBSR		**Batch : 2018-2020**	
Program: M. Sc		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester: ODD (2nd)**	
1	Course Code	**MFS-105**	
2	Course Title	**Advanced Food Safety and Toxicology**	
3	Credits	**4**	
4	Contact Hours (L-T-P)	**3-1-0**	
	Course Status	Compulsory	
5	Course Objective	1. Understanding about food laws and Acts . 2. Importance and need of food regulations. 3. Various hazards in food. 4. Food Quality and Quality Assurance. 5. Food Toxicology and its related studies. 6. Codex; Food Packaging and labeling. 7. Food Additives; Food Adulteration, FSSAI, PFA,HACCP AND CCP	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of Food Laws and Regulations in India. CO2: Develop idea for purpose and action on food safety. CO3: Different laws and Acts. Food Hazards and Toxicology. Various hazards and their control measures CO4: Various terms of Food Quality and Quality assurance and its role in food. Food Adulteration and Food Additives CO5: Recognize the importance and utility of Food safety norms in food Industry. .CO6: Basic understanding with Codex	
7	Course Description	Food safety is an application of various laws and regulations employs on food manufacture Industries. Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food Toxicology could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different regulatory bodies national and International dealing in manufacturing of food products.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION**	**CO1,**
	A	Introduction, Definition , functions and General aspects of FOOD SAFETY	CO1,
	B	Various aspect of Food Quality and Quality Assurance ;ISO	CO1,
	C	Mandatory laws for food processing.	CO1
	Unit 2	**FOOD HAZARDS AND THEIR EVALUATION**	**CO2,**
	A	Types of food hazards: biological, chemical and physical, Risk assessment	CO3
	B	Existing and emerging pathogens due to globalisation of food trade	CO3
	C	Newer systems of safety evaluation such as HACCP and CCP.	CO3
	Unit 3	**REGULATORY BODIES AND ACTS**	**CO4**
	A	Salient features of Food Safety & Standards Act, 2006, Structure of FSSAI.	CO4
	B	PFA and ISO 22000 (Food Safety Management System)	CO4
	C	Managing risks through the food chain via Traceability and Food Recall.	CO4

	Unit 4	**TOXICITY**			**CO5**
	A	Intentional and unintentional contaminants in food industry; Common screening methods.			CO5
	B	Toxicity due to microbial toxins including botulinum and staphylococcal toxins, mycotoxin and due to other food pathogens.			CO5
	C	Food allergy and intolerance; Causes, symptoms and novel methods/products to reduce the effect.			CO5
	Unit 5	**PACKAGING AND LABELLING**			**CO5,CO6**
	A	Food Adulteration (Common adulterants), Food Additives (functional role, safety issues)			CO5
	B	Food Packaging & labeling (Packaging types, understanding labelling rules & Regulation).			CO5
	C	Labelling requirements for pre-packaged food as per CODEX			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1) FSSAI ACTS AND LAWS			
	Other References	2) EMERGING TECHNOLOGIES; FOOD PROCESS BY DA-WEN, 2005 4. FOOD SAFETY by Laura K Egendorf, 2000 5. International standards of food safety by Naomi Rees, David Watson, 2000 6. Codex alimentarius by FAO & WHO, 2007			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS106: Advanced Food Biotechnology

L-T-P: 4-0-0 **Credits: 4**

School: SBSR	**Batch : 2018-2020**
Program: MSc.	**Current Academic Year: 2018-19**
Branch: Food Science and Technology	**Semester: 2 (Even)**

1	Course Code	MFS106	
2	Course Title	**Advanced Food Biotechnology**	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	1. The general objective of this course is to give students an understanding of new advances in food biotechnology. 2.Develop students' knowledge, understanding and skills in food biotechnology at an advanced level 3. Enhance students' ability to identify current and future research directions in food biotechnology.	
6	Course Outcomes	CO1: Principles of Gene technology and its applications CO2: Microbial production of fermented food viz. cheese, bread etc. CO3: Food Preservation – Chemical Methods and Physical methods CO4: Development of novel foods CO5: Biosafety, GM foods	
7	Course Description	Definition of biotechnology, constraints, reasons for the study of biotechnology, industry utilization and biotechnological products for food industry. The use of living organisms or biochemicals to carry out defined chemical processes for food industry application. The goal of this course is to give students an understanding of new advances in food biotechnology.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Food Biotechnology**	
	A	Fundamentals of Molecular Biology-Central dogma, Introduction to prokaryotic and eukaryotic transcription, Translation process in prokaryotes and eukaryotes	
	B	Basic principles of Gene technology and its application in food industry, Food safety and biotechnology- Impact of Biotechnology on foods	CO1
	C	New challenges, Immunological methods, DNA based methods in food authentication	
	Unit 2	**Applications and importance of Food Biotechnology**	
	A	Traditional applications of food biotechnology - Fermented foods: eg. dairy products, alcoholic beverages etc.	
	B	Types of fermented foods. Health benefits of fermented foods and importance of food fermentation in food preservation and nutritional enhancement	CO2, CO4
	C	Development and formulation of novel products such as probiotic and prebiotic foods	
	Unit 3	**Food Preservation**	
	A	Application of Radiation in food processing and storage, Characteristics of Radiations of Interest in Food	CO3

		preservation			
	B	Novel food packaging methods to enhance shelf life			
	C	Radappertization, Radicidation, and Radurization of Foods			
	Unit 4	**Scope of Food Biotechnology**			
	A	Consumer perspective and future of food biotechnology			
	B	Protein engineering in Food technology –objectives, methods, limitations and applications (e.g. Lactobacillus, β-galactosidase, nisin and Glucose isomerase)			CO1, CO3
	C	Introduction to Hurdle concept and Predictive Microbiology			
	Unit 5	**Evaluation and Ethical Consideration**			
	A	Biosafety; risk assessment and risk management			
	B	Ethical issues concerning GM foods			CO5
	C	Testing for GMOs, Labeling and traceability of GM foods.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	• Lee, B.H. Fundamentals of Food Biotechnology. VCH. 2006. • Food Microbiology: Fundamentals and frontiers by M.P. Doyle, L.R. Beuchat and Thoma J. Montville, (2001), 2nd edition, ASM press, USA.			
	Other References	Food Science and Food Biotechnology by G.F.G. Lopez & G.V.B. Canovas			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MMB204: ADVANCED FOOD MICROBIOLOGY
L-T-P: 4-0-0 **Credits: 4**

School: Basic Sciences & Research		**Batch : 2018-2020**	
Program: M. Sc.		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester:2 (Even)**	
1	Course Code	MMB204	
2	Course Title	Advanced Food Microbiology	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	The course is designed to prepare students with a basic understanding of the microbes involved in biological processes such as fermentation and spoilage. The course provides a foundation for careers in microbiology, food microbiology, or research in all branches of food sciences.	
6	Course Outcomes	After the successful completion of this course students will be able to: CO1.Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods. CO2. Understand the role and significance of intrinsic and extrinsic factors on growth and response of microorganisms in foods. CO3. Identify ways to control microorganisms in foods. CO4. Identify the conditions under which the important pathogens and spoilage microorganisms are commonly inactivated, killed or made harmless in foods. CO5. Utilize laboratory techniques to detect, quantify, and identify microorganisms in foods. CO6.Understand the role of fermentation and preservation in food science.	
7	Course Description	The 'Food Microbiology' course outlines the basic principles of Microbiology. This course also sheds light upon fermentation and is designed to make student learn the preservation of food products. The course also further encompasses the concept of identification and quantification of microorganisms in foods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Food and Microorganisms**	
	A	Historical developments	
	B	Microorganisms important for food- molds, yeast and bacteria- general characteristics and importance	

	C	Intrinsic and Extrinsic factors affecting growth of microorganisms, Hydrogen ion conc., water activity, oxidation reduction potential, nutrient content, inhibitory substances and biological structure.			CO1, CO2
	Unit 2	**Contamination and Spoilage of Foods**			
	A	Spoilage of different foods types- Vegetables, fruits, and its products			CO3, CO4
	B	Spoilage of milk and its products			
	C	Spoilage of meat and meat products, poultry, fish and sea foods.			
	Unit 3	**Food Fermentation**			
	A	Production methods of bread, cheese, fermented vegetables and dairy products			CO3, CO6
	B	Production methods of vinegar, wine, oriental fermented foods on industrial scale			
	C	Spoilage and defects of fermented food products			
	Unit 4	**Food Preservation**			
	A	General principles of food preservation			CO6
	B	Preservation of vegetables, fruits, cereals, sugar and its products,			
	C	Preservation of milk and its products, meat and meat products, poultry, fish and sea foods.			
	Unit 5	**Food Borne Infections and Intoxications**			
	A	Bacterial and nonbacterial infection with examples of infective and toxic types, Brucella, Bacillus, Clostridium, Escherichia, Salmonella			CO4,CO5, CO6
	B	Shigella, Staphylococcus, Vibrio, Yersinia, fungi, viruses, and nematodes and emerging food-borne pathogens;			
	C	Food-borne outbreaks, laboratory testing procedures and preventive measures, food sanitation in manufacture and retail trade			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Jay, J.M. (2008) Modern Food Microbiology (Sixth Edition). Aspen Publishers, Inc. Gaithersburg, Maryland.			
	Other References	2. Adams, M. R. and Moss, M. O. (2005) Food Microbiology (Second edition). Royal Society of Chemistry Publication, Cambridge. 3. Ray, B. (2005) Fundamental food microbiology (Third edition). CRC Press, New York, Washington			

		D.C. 4. Frazier, W. C. and West off, D. C. (2007) Food Microbiology. Tata McGraw Hill Publishing Company Ltd. New Delhi. 5. Banwart G J. (1989). Basic Food Microbiology. AVI publication.	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MSB120: BIOINFORMATICS

L-T-P: 4-0-0 **Credits: 2**

School: Basic Sciences & Research		**Batch : 2018-2020**
Program: M. Sc.		**Current Academic Year: 2018-19**
Branch: Food Science and Technology		**Semester:2**
1	Course Code	MSB120
2	Course Title	Bioinformatics
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	**1.** To acquire a fundamental knowledge of bioinformatics by studying an overview of bioinformatics, fields and their scope. To have introduction about database design and Biological database. **2.** To attain knowledge about data storage model, retrieval of information and integration. To learn the procedure of sequence

		alignment and phylogenetic analysis by using different online and offline tool along with their algorithms. **3.** To understand about gene organization, genome sequencing, gene prection methods and motif search methods. **4.** To have a clear cut idea about bioinformatics scope, concepts and major databases/tools/softwares with their algorithms used for various applications.	
6	Course Outcomes	**CO1:** Understand about overview of bioinformatics scope and their disciplines. Generation of large scale data in the field of molecular biology. **CO2:** Review of database source, database management system, Biological databases and their classification. Sequences databases and specialized databases. **CO3:** To attain knowledge about data storage model/format, retrieval of information and integration. **CO4:** Understanding about different sequence formats . Perform sequence alignment and phylogenetic prediction with different tools/softwares with algorithm. **CO5:** To apply different techniques for gene prediction, motif search and genome sequencing analysis. **CO6:** Basic knowledge of various bioinformatics concepts, scope, database usage, tools and software used for each application along with their algorithms.	
7	Course Description	To acquire a fundamental knowledge of basic computational biology by studying, designing and analyzing *in-silico* experiments. To learn the procedure of sequence alignment and its application in molecular phylogenetics. To understand different techniques used for gene prediction and creation of biological databases.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Bioinformatics**	
	A	Introduction to bioinformatics; Scope and importance	CO1, CO6
	B	Large scale generation of molecular biology data	
	C	Different fields in bioinformatics	
	Unit 2	**Biological Databases**	
	A	Introduction of Biological Databases	CO2, CO6
	B	Nucleic acid databases, Protein databases	
	C	Specialized Genome databases, Structure databases	
	Unit 3	**Data Storage and retrieval**	

	A	Controlled vocabulary			
	B	Introduction to Metadata; File Storage			
	C	Boolean Search and Fuzzy Search			CO3, CO6
	Unit 4	**Sequence Alignments and Analysis**			
	A	Biological sequences and Alignment Methods			
	B	Global and Local alignment, Pairwise alignment and Multiple sequence alignment			CO4, CO6
	C	Phlylogenetic tree analysis and its importance			
	Unit 5	**Sequence pattern analysis**			
	A	Structure of Prokaryotic and Eukaryotic gene, DNA sequencing			
	B	Gene finding, composition based finding, sequence motif-based finding			CO5, CO6
	C	Pattern Matching, Regular expression			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Lesk A., *Introduction to Bioinformatics, 3rd Edition.* Oxford University Press (2008). 2. Dan E. Krane and Michael L. Raymer, *Fundamental Concepts of Bioinformatics, 3rd Edition*, Pearson Education (2009).			
	Other References	3. 1. Xiong J., *Essential Bioinformatics.* Cambridge University Press (2006).			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS153: Advanced Food Biotechnology Lab

L-T-P: 0-0-3 **Credits: 2**

School: SBSR		**Batch: 2018-2020**			
Program: MSc.		**Current Academic Year: 2018-19**			
Branch: Food Science and Technology		**Semester: 2 (Even)**			
1	Course Code	MFS153			
2	Course Title	Advanced Food Biotechnology Lab			
3	Credits	2			
4	Contact Hours (L-T-P)	0-0-3			
	Course Status	Compulsory			
5	Course Objective	1. The general objective of this course is to give students an understanding of new advances in food biotechnology. 2.Develop students' knowledge, understanding and skills in food biotechnology at an advanced level 3. Enhance students' ability to identify current and future research directions in food biotechnology.			
6	Course Outcomes	CO1: Microbial production of fermented food viz. cheese, bread etc. CO2: Food Preservation – Chemical Methods and Physical methods CO3: Development of novel foods CO4: Determination of quality of foods CO5: Design of biofermenter and its functioning			
7	Course Description	The use of living organisms or biochemicals to carry out defined chemical processes for food industry application. The goal of this course is to give students an understanding of new advances in food biotechnology.			
8	Outline syllabus				CO Mapping
	Unit 1	**Practical based on biofermenter**			CO5
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Practical related to -- solid state fermentation**			CO2
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Practical --- quality determination of milk by MBRT**			CO4
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Practical related to--- use of microorganisms in food preservation**			CO2
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Practical related to---use of yeast for food production**			CO1
		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	Jury/Practical/Viva			
	Weightage	CA	MTE	ETE	

	Distribution	60%	---------	40%	
	Text book/s*	• Lee, B.H. Fundamentals of Food Biotechnology. VCH. 2006. • Food Microbiology: Fundamentals and frontiers by M.P. Doyle, L.R. Beuchat and Thoma J. Montville, (2001), 2nd edition, ASM press, USA.			
	Other References	Food Science and Food Biotechnology by G.F.G. Lopez & G.V.B. Canovas			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS-154 Advanced Food Microbiology Lab

(L-T-P): 0-0-2 **Credits: 2**

School: SBSR		**Batch: 2018-2020**
Program:		**Current Academic Year: 2018-19**
Branch:		**Semester: 2 (Even)**
1	Course Code	MFS-154
2	Course Title	Advanced Food Microbiology Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory Course
5	Course Objective	• To develop a sense of microbial quality assessment of food products • To use traditional methods to know about type biological hazards in products • To have an overview of the various microbiological methods involved in the determination of contaminants in food. • To develop a working knowledge of the use of food quality in microbiological segment.

6	Course Outcomes	CO1: Comprehend the basic concept of Food Microbiology. CO2: Develop idea for purpose of this in food safety. CO3: Different methodology used to identify various biological hazards and their control measures in food processing CO4: Various internal and external factors involved in of Food Quality and self-life of products. CO5: Recognize the importance and utility of microbial test in Food safety and in food Industry.			
7	Course Description	Food microbiology is an application of various laws and regulations employs on food manufacture Industries and in Food safety application in new product development. The types of hazardsduring processing identification are beneficial in food preservation. In the future Food Microbiology could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different methods in assessment of food products.			
8	Outline syllabus				CO Mapping
	Unit 1	**Practical based on Microbial Quality Assessment**			**CO1,CO2**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Practical related to –Physical Hazards Evaluation**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Practical related to--- Chemical Hazards Evaluation**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Practical related to---Evaluation to Biological Hazard**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Practical related to---Implementation of Microbial Methods on Food Industries**			**CO2,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	------	40%	
	Text book/s*	- Manuals of Food Microbiology			
	Other References	Lab Mannual (NIN)			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS 155: Advanced Food Safety and Toxicology Lab

L-T-P: 0-1-2 **Credits: 2**

School: SBSR		**Batch: 2018-2020**	
Program: M.Sc.		**Current Academic Year: 2018-19**	
Branch: Food Science and Technology		**Semester: 2 (Even)**	
1	Course Code	MFS 155	
2	Course Title	Advanced Food Safety and Toxicology Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-1-2	
	Course Status	Compulsory Course	
5	Course Objective	• To develop a sense of quality assessment of food products • To use traditional methods to know about type hazards in products • To have an overview of the various methods involved in the determination of adulterants in food. • To develop a working knowledge of the use of food quality management system ISO 22000, ISO: 9000 and TQM.	
6	Course Outcomes	CO1: Comprehend the basic concept of Food Laws and Regulations in India. CO2: Develop idea for purpose and action on food safety. CO3: Different laws and Acts. Food Hazards and Toxicology. Various hazards and their control measures CO4: Various terms of Food Quality and Quality assurance and its role in food. Food Adulteration and Food Additives CO5: Recognize the importance and utility of Food safety norms in food Industry.	
7	Course Description	Food safety is an application of various laws and regulations employs on food manufacture Industries. Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food Toxicology could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different regulatory bodies national and International dealing in manufacturing of food products.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on Quality Assessment**	**CO1,CO2**
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 2	**Practical related to –Physical Hazards Evaluation**	**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 3	**Practical related to--- Chemical Hazards Evaluation**	**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 4	**Practical related to---Evaluation to Biological Hazard**	**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 5	**Practical related to---Implementation of HACCP**	**CO2,CO3**

		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	--------	40%	
	Text book/s*	- Food Quality Analysis			
	Other References	Lab Mannual (NIN)			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS 201: Food Quality and Assurance (Theory Subject)

L-T-P: 4-0-0 **Credits: 4**

School: SBSR		**Batch : 2018-2020**
Program: M. Sc		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester: 3rd (Odd)**
1	Course Code	**MFS-201**
2	Course Title	**Food Quality and Assurance**
3	Credits	**4**
4	Contact Hours (L-T-P)	**4-0-0**
	Course Status	Compulsory
5	Course Objective	8. Understanding about food laws and Acts. 9. Importance and need of food regulations. 10. Various hazards in food. 11. Food Quality and Quality Assurance. 12. Food Toxicology and its related studies. 13. Codex; Food Packaging and labeling. 14. Food Additives; Food Adulteration 15. FSSAI,PFA,HACCP AND CCP
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of Food Laws and Regulations in India. CO2: Develop idea for purpose and action on food safety. CO3: Different laws and Acts. Food Hazards and Toxicology. Various hazards and

		their control measures CO4: Various terms of Food Quality and Quality assurance and its role in food. Food Adulteration and Food Additives CO5: Recognize the importance and utility of Food safety norms in food Industry. . CO6: Basic understanding with Codex	
7	Course Description	Food quality is an application of various laws and regulations employs on food manufacture Industries. Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food Toxicology could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different regulatory bodies national and International dealing in manufacturing of food products.	
8	Outline syllabus		CO Mapping
	Unit 1	**General principles for food safety and hygiene**	**CO1,**
	A	Introduction, Definition , functions and General aspects of FOOD SAFETY	CO1,
	B	Various aspect of Food Quality and Quality Assurance ;ISO	CO1,
	C	Mandatory laws for food processing.	CO1
	Unit 2	**Implementation, documentation and record keeping**	**CO2,**
	A	Types of food hazards: biological, chemical and physical, Risk assessment	CO3
	B	Existing and emerging pathogens due to globalisation of food trade	CO3
	C	Newer systems of safety evaluation such as HACCP and CCP.	CO3
	Unit 3	**National standards**	**CO4**
	A	Salient features of Food Safety & Standards Act, 2006, Structure of FSSAI.	CO4
	B	PFA and ISO 22000 (Food Safety Management System)	CO4
	C	Managing risks through the food chain via Traceability and Food Recall.	CO4
	Unit 4	**International bodies dealing in standarization**	**CO5**
	A	Intentional and unintentional contaminants in food industry; Common screening methods.	CO5
	B	Toxicity due to microbial toxins including botulinum and staphylococcal toxins, mycotoxin and due to other food pathogens.	CO5
	C	Food allergy and intolerance; Causes, symptoms and novel methods/products to reduce the effect.	CO5
	Unit 5	**Recent concerns**	**CO5,CO6**
	A	Food Adulteration (Common adulterants), Food Additives (functional role, safety issues)	CO5
	B	Food Packaging & labelling (Packaging types, understanding labelling rules & Regulation).	CO5
	C	Labelling requirements for pre-packaged food as per CODEX	CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1) FSSAI ACTS AND LAWS	
	Other References	2) EMERGING TECHNOLOGIES; FOOD PROCESS BY DA-WEN, 2005 4. FOOD SAFETY by Laura K Egendorf, 2000 5. International standards of food safety by Naomi Rees, David Watson, 2000 6. Codex alimentarius by FAO & WHO, 2007	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS 202: TECHNOLOGY OF MEAT, POULTRY AND SEA FOODS (Theory Subject)

L-T-P 3-1-0 **Credits: 4**

School: SBSR		**Batch : 2018-2020**
Program: M. Sc		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester: 3rd (Odd)**
1	Course Code	**MFS-202**
2	Course Title	**TECHNOLOGY OF MEAT, POULTRY AND SEA FOODS**
3	Credits	**4**
4	Contact Hours (L-T-P)	**3-1-0**
	Course Status	Compulsory
5	Course Objective	1. Describe the structure and composition of meat 2. Outline the post-harvest changes that occur in animal flesh after slaughter 3. Describe major meat quality attributes, their measurement and processes used to ensure quality 4. Describe the processes that should be followed to obtain quality meat from animals 5. Develop skills in processing and preservation of meat, fish and poultry products
6	Course Outcomes	After completing this course students will get to know about the nutritional profile and processing methods meat, poultry, fish and egg. CO1: Gain knowledge on the methods of grading meat CO2: Different techniques available to slaughter animal CO3: Different methods of tenderizing meat Methods of preserving meat CO4: Processing and preservation of egg and fish CO5: Quality control and standardization of meat, fish and poultry CO6: Poultry industry in India
7	Course Description	This course deals with the technology involved in the processing and storage of the various food products originating from meat, fish, poultry and eggs. Icing, freezing and

		cold storage. Drying and smoking salt fish products. Fish protein concentrates. Disposal of waste products of meat, fish and poultry processing. The safety issues associated with these products will also be emphasised.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION**	**CO1, CO2, CO3**
	A	**Introduction**	CO1, CO2
	B	Livestock and poultry population in India	CO1, CO3
	C	Development of meat and poultry industry in India and its need in nation's economy Glossary of live market terms for animals and birds	CO1
	Unit 2	**Meat preservation and quality**	**CO2, CO3**
	A	Effects of feed, breed and environment on production of meat animals and their quality	CO2
	B	Meat Quality-color, flavor, texture, Water-Holding Capacity(WHC)	CO2
	C	Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing.	CO2
	Unit 3	**Slaughtering and Carcass Processing**	**CO3**
	A	Modern abattoirs, typical layout and features, Ante-mortem handling and design of handling facilities	CO3
	B	Hoisting rail and traveling pulley system; stunning methods; steps in slaughtering and dressing; offal handling and inspection	CO3
	C	Operational factors affecting meat quality; effects of processing on meat tenderization; abattoir equipment and utilities .	CO3
	Unit 4	**Processing of Poultry Products**	**CO4**
	A	Poultry industry in India; measuring the yields and quality characteristics of poultry products, microbiology of poultry meat, spoilage factors	CO4
	B	Lay-out and design of poultry processing plants, Plant sanitation; Poultry meat processing operations, equipment used – Defeathering, bleeding, scalding etc.	CO4
	C	Packaging of poultry products, refrigerated storage of poultry meat, by products – eggs, egg products, Whole egg powder, Egg yolk products, their manufacture, packaging and storage.	CO4
	Unit 5	**Fish and other Marine Products Processing**	**CO5, CO6**
	A	Commercially important marine products from India; product export and its sustenance; basic biochemistry and microbiology	CO5
	B	Preservation of postharvest fish freshness; transportation in refrigerated vehicles; deodorization of transport systems; design of refrigerated and insulated trucks	CO5
	C	Grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by-products.	CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Forrest JC. 1975. Principles of Meat Science. Freeman 2. Govindan TK. 1985. Fish Processing Technology. 3. IBH. Hui YH. 2001. Meat Science and Applications. Marcel Dekker.	
	Other References		

MFS 203: WASTE MANAGEMENT IN FOOD INDUSTRIES (Theory Subject)

L-T-P: 2-0-0 Credits 4

School: SBSR		**Batch : 2018-2020**	
Program: M. Sc		**Current Academic Year: 2019-20**	
Branch: Food Science and Technology		**Semester: 3rd (Odd)**	
1	Course Code	**MFS-203**	
2	Course Title	**WASTE MANAGEMENT IN FOOD INDUSTRIES**	
3	Credits	**4**	
4	Contact Hours (L-T-P)	**3-1-0**	
	Course Status	Compulsory	
5	Course Objective	1. Understanding about food industry waste. 2. Importance and need of management the industrial waste. 3. Various treatment methods available for food waste. 4. Types, availability and utilization of by-products from waste. 5. Biomethanation and bio composting technology for organic waste utilization 6. Industrial waste treatments and ways for waste disposal method. 7. Food Additives; Food Adulteration	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of waste and types. CO2: Waste Disposal method. Recognize the importance and utility of waste from food Industry CO3: Treatment of plant waste by physical, chemical and biological methods, Effluent treatment plants, Use of waste and waste water. Various hazards and their control measures. CO4: Types, availability and utilization of by-products of cereals, legumes & oilseeds, Utilization of by-products from food processing Industries. CO5: Status and utilization of dairy by-products. Industrial waste management CO6: Case study.	
7	Course Description	Food waste management is an application of utilization food waste. The types of treatment applied during processing identification are beneficial as by product recovery. In the future waste management could offer more depth knowledge with its applicable techniques. In this course, students will learn about the different treatments required in food manufacturing.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION**	**CO1,**
	A	Waste and its consequences in pollution and global warming.	CO1,
	B	Types of food processing wastes & their present disposal methods.	CO1, CO2
	C	Identification of waste.	CO1
	Unit 2	**TREATMENT OF PLANT WASTE**	**CO2, CO3**
	A	Treatment of plant waste by physical, chemical and biological methods.	CO2
	B	Solid and liquid waste.	CO2
	C	Use of waste and waste water.	CO2
	Unit 3	**BYPRODUCTS FROM WASTES**	**CO3**
	A	Types, availability and utilization of by-products	CO3
	B	Utilization of by-products from fruits and vegetables processing	CO3

		industries			
	C	Utilization of by-products from sugar and agro based industries, and brewery & distillery waste.			CO3
	Unit 4	**UTILIZATION OF DIFFERENT WASTE PRODUCTS**			**CO4**
	A	Status and utilization of dairy by-products.			CO4
	B	Availability & utilization of by-products of meat industry.			CO4
	C	Availability & utilization of by-products of poultry industry and fish processing units.			CO4
	Unit 5	**TECHNIQUES FOR WASTE UTILIZATION**			**CO5, CO6**
	A	Biomethanation and biocomposting technology for organic waste utilization			CO5
	B	Incineration & efficient combustion technology			CO5
	C	Integration of new and renewable energy sources for waste utilization. Case studies.			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1) Beggs C. Energy Management and Conservation. Elsevier Publ. Chaturvedi P. 2000.			
	Other References	2) Energy Conservation through Waste Utilization. American Society of Mechanical Engineers, New York. Kreit F & Goswami DY. 2008. 3) Energy Management and Conservation Handbook. CRC Press. 4) Murphy WR &Mckay G. 1982. Energy Management. BS Publ. Patrick DR. 1982.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

TECHNIQUES IN FOOD ANALYSIS (Theory subject): MFS206

School: SBSR	**Batch: 2018-2020**		
Program: Masters	**Current Academic Year: 2019-20**		
Branch: Food Science and Technology	**Semester: 3rd (odd)**		
1	Course Title	**TECHNIQUES IN FOOD ANALYSIS**	
2.	Course Code	MFS206	
3.	Credits	4	
4.	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objectives	1. To develop industrial approach in students for Food Analysis 2. To develop the expertise for new techniques for food Quality Assurance.	
6	Course Outcomes	After successfully completion of this course students will be able to: **CO1.**Understand the food Quality Techniques for Quality Assurance **CO2.**Understand the technology and manufacture of technical Instruments **CO3.** Perform the analysis of various food Products **CO4.**Understand the Science behind analytical techniques **CO5.**Understand about application of Analytical Techniques. **CO6.**Understand the implementation of new techniques in Quality Assurance or Research and Development.	
7	Course Description	Today's life depends very much on safe foods and its quality assurance. This course demonstrates broad knowledge about quality analytical techniques applied on bakery, confectionary and extruded products development and machineries related to the products and other all food products prepared for consumers This course provides the knowledge about analytical Techniques This course will be helpful for joining industry as well as setting up one's own industry.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction Food Analysis**	**CO1, CO6**
	A	Introduction to Sampling Techniques and their functions; Machines and instruments for Analysis.	CO1, CO6
	B	Methodology of Sample preparation. Significance in Food Quality	CO1, CO6
	C	Calibration and Standardization of different Instruments.	CO1, CO6
	Unit 2	**ANALYSIS TECHNIQUES**	**CO2, CO6**
	A	Technology for Spectroscopic Techniques using UV/Vis analytical Techniques	CO2, CO6
	B	Fluorescence, IR , FTIR, NIR, NMR, Atomic	CO2, CO6

		Absorption ,ICP,			
	C	Quality consideration and parameters; Polarimetry, referactrometry, microscopic techniques in Food Analysis (Light microscopy, SEM,TEM, XRD, particle size analysis, image analysis).			CO2, CO6
	Unit 3	**CHROMATOGRAPHIC TECHNIQUES**			**CO3, CO6**
	A	Testing of Samples from Chromatographic Techniques: adsorption, column, partition, affinity, ion exchange			CO3, CO6
	B	Methods for GC			CO3, CO6
	C	GLC, HPLC, HPTLC, GCMS, LCMS.			CO3, CO6
	Unit 4	**SEPERATION TECHNIQUES**			**CO4, CO6**
	A	Quality characteristics and Separation Techniques in Food			CO4, CO6
	B	Separation Technique: Gel Filtration, dialysis, electrophoresis, sedimentation. Ultra filtration and Ultracentrifugation, Solid Phase extraction,			CO4, CO6
	C	Supercritical fluid extraction, isoelectric forces, isotopic Techniques, Manometric Techniques.			CO4, CO6
	Unit 5	**IMMUNOASSAY TECHNIQUES**			**CO5, CO6**
	A	Importance and applications of Immunoassay techniques			CO5, CO6
	B	Special Techniques immunoassay Techniques; Isotopic, non-isotopic and Enzyme Immunoassay; Surface Tension, Enzymatic methods of Food Analysis			CO5, CO6
	C	Thermal methods in Food analysis, Differential scanning colorimetric and others techniques.			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	**1** Pomeranz, Y and Meloan, C.E., 1994.Food Analysis- Theory and Practice, Springer US 3rd Edition. 2. Nielsen S. (Eds).1994.Introduction to Chemical Analsis of Foods. Jones and Bartlett.			
	Other References	**1.** Krik RS & Sawer R.1991.Pearson's Chemical Analysis of Foods.9th Edition Longman Scientific &Technical **2.** Leo ML., 2004. Handbook of Food Analysis.2nd Ed. Vol I-III			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1

CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFP-252: Food Quality and Assurance Lab

L-T-P: 2-0-0 **Credits 2**

School: SBSR		**Batch: 2018-2020**
Program: Masters		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester: 3rd (odd)**
1	Course Code	MFP-252
2	Course Title	Food Quality and Assurance Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory Course
5	Course Objective	• To develop a sense of food quality assessment of food products • To use traditional methods to know about type biological hazards in products • To have an overview of the various microbiological methods involved in the determination of contaminants in food. • To develop a working knowledge of the use of food quality in nutritional segment.
6	Course Outcomes	CO1: Comprehend the basic concept of Food adulteration. CO2: Develop idea for purpose of this in food safety. CO3: Different methodology used to identify various biological hazards and their control measures in food processing CO4: Various internal and external factors involved in of Food Quality and self-life of products. CO5: Recognize the importance and utility of microbial test in Food quality and in food Industry.
7	Course Description	Food quality and Assurance is an application of various laws and regulations employs on food manufacture Industries and in Food safety application in new product development. The types of hazards during processing identification are beneficial in food preservation. In the future Food Microbiology could offer more depth knowledge with toxicological studies of food. In this course, students will learn about the different methods in assessment of food products.
8	Outline syllabus	CO Mapping

	Unit 1	**Practical based on FSMS:22000 Quality Assessment**			**CO1,CO2**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Practical related to –HACCP Hazards Evaluation**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Practical related to---Physical, Chemical Hazards Evaluation**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Practical related to---Evaluation to Biological Hazard**			**CO1,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Practical related to---Implementation of Quality assessment Methods on Food Industries**			**CO2,CO3**
		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	---------	40%	
	Text book/s*	- Manuals of Food Quality Assurance			
	Other References	Lab Mannual (NIN)			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Meat Technology Lab: MFP202

L-T-P: 0-0-3 **Credits: 2**

School: SBSR	**Batch: 2018-2020**
Program: Masters	**Current Academic Year: 2019-20**
Branch: Food Science and Technology	**Semester: 3rd (odd)**

Course Code: MFP 202	**Course Title:** Meat Technology Lab

Course outcomes:

After successful completion of this course students will be able to:

- CO1: Identify the quality parameters of egg.
- CO2: Understand basic techniques to preserve meat and meat products.
- CO3: Explain the importance of Crude fiber in daily life and how to analyses it from animal feed.
- CO4: Understand how to prepare standard solution and able to explain normality and Molarity.
- CO5: Analyze the microbial quality of meat and milk.
- CO6: Estimation of physical properties of the animal products and industrial visit.

Unit	Topic
I	• Determination of external and internal quality of poultryegg. • To study the effect of time, temp on co-agulation properties of egg.
II	• Preparation of different types of meat products usingdifferent methods of preservation. • Preservation and evaluation of different egg products
III	• Practical related to fibre content of meat Estimation oftotal fibre content of meat • Practical related to solution preparation
IV	• Estimation of bacterial numbers in a given sample ofmeat • Estimation of yeast and mould numbers in a givensample of meat • Determination of microbiological quality of milk of MBR test.
V	• Water holding capacity and colour of different meat type • Moisture and protein content of different meat type • Visit to meat, fish and poultry processing industries.

Suggested Readings:

1) Lawrie R A, Lawrie's Meat Science, 5th Ed, Woodhead Publisher, England, 1998
2) Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997
3) Pearson & Gillet Processed Meats,3 Ed, CBS Publication, New Delhi, 1997
4) Shai Barbut,Poultry Products Processing,CRC Press 2005
5) Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi,

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2

CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS251: Dissertation I

School: SBSR		**Batch : 2018-2020**			
Program: M.Sc.		**Current Academic Year: 2019-20**			
Branch: Food Science and Technology		**Semester: Odd (3rd)**			
1	Credits	2			
2	Contact Hours(L-T-P)	0-0-3			
3	Course Status	Compulsory			
4	Course Objective	1. To learn independent study, formulate hypothesis			
5	Course Outcomes	After studying this course, students will be able to; CO1: Develop understanding of research and research methodologies CO2: Undertake identification of problem and review of literature CO3: Undertake R &D activities for the development of science/product CO4: Interpretation of the outcome and results CO5: Enhance presentation and interpretation skills. CO6: Enhance the skill of scientific writing and demonstration of the research area.			
6	Course Description	The course comprises of features of independent project work			
7	Outline syllabus				
	Unit 1	**Define a problem**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Literature review**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Formulate hyothesis**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Project work**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Presentation**			
		Sub unit - a, b and c detailed in Instructional Plan			
8.	Mode of examination	Practical			
9.	Weightage	CA	MTE	ETE	

	Distribution	60%	----	40%	
10.	Text book/s*	Research articles available on Google scholar, Science direct, Research methodology related books			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS205: Technology of Plant Derived Plants

L-T-P: 4-0-0 **Credits 4**

School: SBSR		**Batch : 2018-20**
Program: M.Sc		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester:04 (Even)**
1	Course Code	MFS205
2	Course Title	**Technology of Plant Derived Plants**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The course is designed to equip students with a broad understanding of the milk and processed foods processing techniques. The course provides a foundation for careers in new product development, dairy industry, quality control or research in all branches of the food science.
6	Course Outcomes	At the end of the course, students will be able to: CO1. Compare similarities and differences between value added and unprocessed foods. CO2 Analyze the effects of various heat treatments on milk and related products. CO3 Understand the processing of animal and plant derived oils. CO4 Discuss the role of probiotics as a functional food. CO5 Understand the processing of baby foods and ready to eat breakfast cereals.

		CO6 Examine the role of nutraceuticals in food industry. CO7 Analyze codex and its uses in food industry.				
7	Outline syllabus				CO Mapping	
	Unit 1	**Dairy Chemistry and Microbiology**				
	A	Introduction, Milk - composition, food and nutritive value, physico-chemical properties.			CO1, CO2,CO3	
	B	Buying and collection of milk – transportation of milk – milk reception – contaminants - Milk reception in dairies				
	C	Quality and Quantity tests at reception - Applications of enzymes in dairy industry				
	Unit 2	**Milk Processing**				
	A	Milk Processing flow sheet – Filtration / clarification, Storage of milk, Standardization – simple problems in standardization, Homogenization,			CO1, CO2	
	B	Pasteurization – Types of pasteurization process.			CO1, CO3	
	C	Equipment's used in each process - Cream separating centrifuges, Pasteurizers (Heat Exchangers), Homogenizers, Bottle and pouch fillers, Milk Chillers, Plant piping, Pumps				
	Unit 3	**Oil and Fat Processing**				
	A	Processing of oils – Degumming, refining, bleaching, deodorization, fractionation; Pyrolysis of fats, toxicity of frying oil.			CO3,CO5	
	B	Plastic fat – Winterization, hydrogenation, esterification, inter-esterification and emulsification				
	C	Application of plastic fat in bakery, confectionary (including cocoa butter replacers), shortenings, margarine processing				
	Unit 4	**Value added plant based products**				
	A	Breakfast and ready to eat cereals; Infant formulas; Protein mixes;, ,			CO5,CO6	
	B	Vegetable Mixes; Dairy product e.g. ice cream; Beverages including diet beverages)				
	C	Value addition in processed food products e.g. pasta, ice cream, pizza, wafers, rolls buns, jam, jelly, sauce, pickles, waffles				
	Unit 5	**Plant based functional foods**				
	A	Types of functional foods: Concepts of Probiotic, Nutraceuticals, Spiceuticals			CO4,CO6,CO7	
	B	Regulatory and labelling issues				
	C	CODEX				
	Mode of examination	Theory				
	Weightage Distribution	CA	MTE	ETE		
		30%	20%	50%		
	Text book/s*	Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2				
	Other References	1. Food Chemistry by L. H. Muyer, CBS PUBLISHERS & DISTRIBUTORS-NEW DELHI, 2004 Edition. 2. Handbook of analysis and quality control for fruit and vegetable products by S.Ranganna Tata McGraw-Hill, c1986.				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS204: Bakery, Confectionery and Extruded products (theory Subject)

L-T-P: 4-0-0 **Credits 4**

School: SBSR		**Batch : 2018-2020**
Program: M.Sc.		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester: Even (4th)**
1	Course Code	MFS204
2	Course Title	Bakery, Confectionery and Extruded products
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To develop industrial approach in students for bakery, chocolate and confectionary industry. 2. To develop the expertise for new techniques for snack food.
6	Course Outcomes	After successfully completion of this course students will be able to: **CO1.** Understand the functions of bakery ingredients, machineries and various rheological testing of dough. **CO2.** Understand the technology and manufacture of bakery products and losses in bakery. **CO3.** Perform the analysis of bakery ingredients and manufacture various bakery products and chocolate with maintaining safety and hygiene of bakery plants.

		CO4. Understand the technology and manufacture of confectionery . products, with standards and regulations for confectionary **CO5.**Understand about extrusion cooking, machineries and products. **CO6.**Understand the processing technology of bakery ,confectionery and extruded products.	
7	Course Description	Today's life depends very much upon not only bread and snack foods but also chocolates and confectionary. This course demonstrates broad knowledge about bakery, confectionary and extruded products development and machineries related to the products. Hygiene is also important factor for the same and this course provides the knowledge about bakery plant safety with hygiene. This course will be helpful for joining industry as well as setting up one's own industry.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to baking**	**CO1, CO6**
	A	Introduction to baking; Bakery ingredients and their functions; Machines and equipment for batch and continuous processing of bakery products	CO1, CO6
	B	Dough development; methods of dough mixing; dough chemistry	CO1, CO6
	C	Rheological testing of dough-Farinograph, Mixograph, Extensograph, Amylograph / Rapid ViscoAnalyzer, Falling number, Hosney's dough stickiness tester	CO1, CO6
	Unit 2	**Manufacturing of bakery products**	**CO2, CO6**
	A	Technology for the manufacture of bakery products-bread, biscuits, cakes	CO2, CO6
	B	Effect of variations in formulation and process parameters on the quality of the finished product	CO2, CO6
	C	Quality consideration and parameters; Staling and losses in baking	CO2, CO6
	Unit 3	**Analysis of bakery products**	**CO3, CO6**
	A	Testing of flour; Cake icing techniques, wafer manufacture, cookies, crackers, dusting or breading	CO3, CO6
	B	Manufacture of bread rolls, sweet yeast dough products, cake specialties, pies and pastries, doughnuts, chocolates and candies	CO3, CO6
	C	Coating or enrobing of chocolate (including pan-coating); Maintenance, safety and hygiene of bakery plants.	CO3, CO6
	Unit 4	**Quality characteristics of confectionery ingredients**	**CO4, CO6**
	A	Quality characteristics of confectionery ingredients; technology for manufacture of flour, fruit, milk, sugar, chocolate, and special confectionery products	CO4, CO6
	B	Colour, flavour and texture of confectionery; standards and regulations	CO4, CO6

	C	Machineries used in confectionery industry			CO4, CO6
	Unit 5	**Extrusion**			**CO5, CO6**
	A	Importance and applications of extrusion in food processing; Pre and post extrusion treatments			CO5, CO6
	B	Manufacturing process of extruded products			CO5, CO6
	C	Change of functional properties of food components during extrusion.			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	**1.** Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.			
	Other References	**1.** Bakery Technology & Engineering; Matz SA; 1960; AVI Pub. **2.** Up to-date Bread Making; Fance WJ &Wrogg BH; 1968, Maclasen & Sons Ltd.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

MFS253: Dissertation II

School: SBSR		**Batch : 2018-2020**
Program: M.Sc.		**Current Academic Year: 2019-20**
Branch: Food Science and Technology		**Semester: Even (4)**
1	Credits	8
2	Contact Hours(L-T-P)	0-0-16
3	Course Status	Compulsory
4	Course Objective	1. To learn independent study, formulate hypothesis

5	Course Outcomes	After studying this course, students will be able to; CO1: Develop understanding of research and research methodologies CO2: Undertake identification of problem and review of literature CO3: Undertake R &D activities for the development of science/product CO4: Interpretation of the outcome and results CO5: Enhance presentation and interpretation skills. CO6: Enhance the skill of scientific writing and demonstration of the research area.			
6	Course Description	The course comprises of features of independent project work			
7	Outline syllabus				
	Unit 1	**Define a problem**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 2	**Literature review**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 3	**Formulate hyothesis**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 4	**Project work**			
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Presentation**			
		Sub unit - a, b and c detailed in Instructional Plan			
8.	Mode of examination	Practical			
9.	Weightage Distribution	CA	MTE	ETE	
		60%	----------	40%	
10.	Text book/s*	Research articles available on Google scholar, Science direct, Research methodology related books			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2