



SCHEME OF INSTRUCTIONS

and

SYLLABI OF

MASTER OF SCIENCE

IN

FOOD TECHNOLOGY

Choice Based Credit System (CBCS)

(w.e.f. Academic Session 2021-2022)

Department of Agriculture

INVERTIS UNIVERSITY, BAREILLY

Invertis Village, NH-24, Bareilly

U.P.-243123

Program Outcomes of M.Sc. Food Technology

After completion of the program of M.Sc. in Food Technology, students will have the following attributes:

PO1 Understand and demonstrate comprehensive knowledge of food science and technology branch.

PO2 Conduct scientific experiments and document scientific investigations in the area of food science and technology.

PO3 Design solutions for food quality and safety issues.

PO4 Apply various food processing, preservation and packaging technologies.

PO5 Analyse and explain with illustrations chemical, biochemical and microbiological phenomenon as applied to food processing and preservation.

PO6 Evaluate food quality and safety using advanced instrumentation.

PO7 Create leadership qualities for realization of various goals and manifest the innovative business plans.

PO8 Contextual knowledge to assess societal and cultural issues in food technology and suggest viable solutions.

PO9 Ability to use appropriate research methodology in Food Technology.

PO10 Awareness about ethical conduct in professional and personal context.

PO11 Manage information, develop scientific reports and make presentations.

PO12 Engage independent and life-long learning about the changes and developments taking place in agricultural scenario in the country.

SCHEME OF EVALUATION
M.Sc. –FOOD TECHNOLOGY
I-YEAR, SEMESTER-I
(w.e.f. academic session 2021-22)

S. No.	Category	Course Code	SUBJECT	PERIODS			CREDIT	MARKS		
				L	T	P		DISTRIBUTION		
								IAM	ESM	TOTAL
THEORY										
1	Core Course(CC)	MFT-101	Principle of Food Processing and Preservation	3	1	0	4	30	70	100
2	Core Course(CC)	MFT-102	Food Chemistry	3	1	0	4	30	70	100
3	Core Course(CC)	MFT-103	Food Analysis and Instrumentation	3	1	0	4	30	70	100
4	Core Course(CC)	MFT-104	Food Microbiology	3	1	0	4	30	70	100
5	AECC	MFT-105	Communication Skills and technical writing	2	0	0	2	15	35	50
6	Non Credit	MFT-106	Human Values and Ethics	2	0	0	0	15	35	50
PRACTICAL / TRAINING / PROJECT / SEMINAR										
7	Lab. Courses	MFT-151	Food Processing and Preservation Lab	0	0	4	2	15	35	50
8	Lab. Courses	MFT-152	Food Chemistry Lab	0	0	4	2	15	35	50
9	Lab. Courses	MFT-153	Food Analysis and Instrumentation Lab	0	0	4	2	15	35	50
Total				16	4	12	24	295	455	650
Abbreviations Used	L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks CC= Core Course, DSE=Discipline Specific Electives, GE-Generic Elective, AECC-Ability Enhancement Compulsory Core Courses, SEC=Skill Enhancement Course									

SCHEME OF EVALUATION
M.Sc. – FOOD TECHNOLOGY
1st-YEAR, SEMESTER-II
(w.e.f. academic session 2021-22)

S. No.	Category	Course Code	SUBJECTS	PERIODS			CREDIT	MARKS		
				L	T	P		DISTRIBUTION		
								IAM	ESM	TOTAL
THEORY										
1	CC	MFT-201	Technology of Fruits and Vegetables	3	1	0	4	30	70	100
2	CC	MFT-202	Unit operations in Food Engineering	3	1	0	4	30	70	100
3	CC	MFT-203	Research Methodology, Statistics and Computer Applications	3	1	0	4	30	70	100
4	DSE(1*)	MFT-204	Technology of legumes and oilseeds	3	1	0	4	30	70	100
		MFT-205	Technology of meat, poultry and Fish Products							
5	GE(1*)	MFT-206	Intellectual Property Rights	2	0	0	2	15	35	50
		MFT-207	Quality Control and Food Laws							
PRACTICAL / TRAINING / PROJECT / SEMINAR										
6	Lab Course	MFT-251	Technology of Fruits and Vegetables Lab	0	0	4	2	15	35	50
7	SEC	MFT-252	Seminar	0	0	2	1	50	0	50
8	SEC	MFT-253	Industrial Training**	0	0	0	4	0	100	100
Total				14	4	06	25	200	450	650
Abbreviations Used	L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks CC= Core Course, DSE=Discipline Specific Electives, GE=Generic Elective, AECC=Ability Enhancement Compulsory Core Courses, SEC=Skill Enhancement Course									

(*) Students will have choice to opt only one out of the two courses.

(**)The students will have to undergo for internship during the winter break for maximum of 4 weeks after 1st semester, however, the viva voce will be conducted in the 2nd semester and hence the credits will be given to the students in the 2nd semester.

MFT-101 Principles of Food Processing and Preservation

Teaching Scheme

Lectures: 3 hrs/week

Tutorials: 1 hr/week

Credits: 4

Examination Scheme

Internal Assessment Marks[IAM]:30

[Class Test: 12, Teachers assessment: 6, Attendance: 12]

End Semester Marks[ESM]: 70

Course Objectives:

1. To give knowledge of historical development of food processing and preservation.
2. To give knowledge of general aspects of methods of food processing and preservation.
3. Gives knowledge of effect of processing on different foods.
4. To impart knowledge on technology behind various food processings.
5. To impart knowledge about food preservation and its various techniques.

Detailed Syllabus

Module I

Scope and importance of food processing; historical developments in food processing; food spoilage: microbial, physical, chemical & miscellaneous. Water activity: role of water activity in food preservation, intermediate moisture foods (IMF) principles, characteristics, advantages and problems of IM foods. Thermal and Non thermal Food preservation techniques.

MODULE 2

Heat preservation and processing: heat resistance of microorganisms, thermal death curve, types of heat treatments and effects on foods, canning of foods, cans and container types, spoilage of canned foods, heat penetration, brief concept of different heat processing methods: blanching, roasting, frying, baking, extrusion cooking etc. Dehydration: drying, dehydration and concentration, drying curves, drying methods and type of dryers; food concentration, methods of concentration of fruit juices, liquid food concentrates, changes in food during dehydration and concentration.

MODULE 3

Refrigeration storage: requirements of refrigeration storage, changes of foods during refrigeration storage, refrigeration load, chilling and refrigeration, cold storage.

Freezing and frozen storage: freezing curves, slow and quick freezing, factors determining freezing rate, freezing methods, changes in food during freezing, frozen food storage, Lyophilisation, Cryogenic Freezing, Dehydro freezing, Freeze Concentration, IQF.

MODULE 4

. Novel Food Processing, – mushrooms, algae, leaf protein concentrates, protein from petroleum yeast, food analogues, edible insects.

MODULE 5

Natural and Chemical Food Preservatives – types, permissible limits, safety aspects .Chemical preservation: types, uses and effects of class I and class II preservatives in foods.

Non thermal preservation techniques. Advanced food preservation methods – food irradiation - safety and quality of irradiated foods. microwave and Ohmic processing of foods- principles, procedure and applications. Application of nanotechnology in food preservation.

Suggested Readings

1. Norman, N.P and Joseph, H.H.(1997). Food Science, Fifth edition, CBS Publication,New Delhi .
2. Frazier, W.C and Westhoff, D.C (1996). Food Microbiology, 4 th edition, Tata Mc Graw Hill Publication, New Delhi.
3. Kalia M. and Sangita, S. (1996). Food Preservation and Processing, First edition, Kalyani Publishers, New Delhi.
4. Desrosier & Desrosier, Technology of Food Preservation. Avi Publishing Co Inc.4edtn.2004.
5. Fellows, Food process technology: Principles and Technology, CRC publications,2000.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the historical development of food science and technology.
2. Understand the various food processing methods.
3. Understand about the different terminology related to low temperature food processing.
4. Understand the novel food processings and food analogues.
5. Understand the different types of preservatives and preservation technology involved.

MFT-102 Food Chemistry

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week	Internal Assessment Marks[IAM]:30
Tutorials: 1 hr/week	[Class Test: 12, Teachers assessment: 6,Attendance: 12]
Credits: 4	End Semester Marks[ESM]: 70

Course Objectives:

1. To give knowledge of carbohydrate food molecules and types of starches in food chemistry.
2. To give knowledge about protein molecules and various protein systems, isolates and concentrates within food.
3. Gives knowledge of dietary requirements of lipids and its refining.
4. To impart knowledge on role of vitamins in food.
5. To understand plant based pigments and emulsions in food.

Detailed Syllabus

MODULE 1
Water: properties, bonding and chemistry. Carbohydrates: Classification, structure and properties of carbohydrates. Role of carbohydrates in food industry. Sugar, starch, cellulose, glucans, hemicelluloses, gums, pectic substances, polysaccharides. Resistant Starches and Dietary Fibre – Definition, Sources and Functions. Modified starches.
MODULE 2
Proteins: Classification, structure, properties, purification and denaturation of proteins. Browning reaction in foods: Enzymatic and non-enzymatic browning in foods of vegetable and animal origin during storage and processing of foods. Egg proteins, meat proteins, fish muscle proteins, oil seed proteins and cereal proteins. Concept of protein quality, dietary requirements, deficiency symptoms. Single cell proteins, Stress and Anti-freeze Proteins; Protein Isolates and Concentrates.
MODULE 3
Lipids: Classification and physico-chemical properties of food lipids. Refining of crude oils, hydrogenation and winterization. Vegetable and animal fat, margarine, lard, butter. Frying and shortening. Flavor changes in fats and oils, lipid oxidation, factors affecting lipid oxidation, autooxidation, biological significance of auto-oxidation of lipids.
MODULE 4
Vitamins: Role of vitamins in food industry, effect of various processing treatments and fortification of foods. Food sources, effects of deficiency Minerals: Role of minerals in food industry, effects of various processing treatments. Effects of excess, if any, and deficiency.

MODULE 5

Biological changes in foods: Plant pigments and their roles in food industry. Bitter substance and tannins. Flavor Composition of Foods and beverages

Emulsion: Definition, Theory, Emulsifiers: Properties, role & action in stabilizing an emulsion.

Suggested Readings

1. Fennema, O.R. Ed. 2008, 4th Ed. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
2. Meyer, L.H. 2004. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
3. Potter, N.N. 1995. Food Science. 3rd Ed. AVI, Westport.
4. De Man., J.M.2018. Principles of Food Chemistry. AVI, Springer International Publishing.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the role of water carbohydrates and starches in food.
2. Understand about the different protein molecules present in food, their structure and function.
3. Understand about the different lipid molecules present in food, their structure and function and refining.
4. Understand about the different vitamins in food and their function.
5. Understand about the different biological changes in foods: Plant pigments and their roles in food industry. Emulsions and its uses.

MFT-103 Food Analysis and Instrumentation

Teaching Scheme Lectures:3 hrs./ week Tutorials:1 hr/week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70
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Course Objectives:

- 1.To give knowledge about preparation of chemical solutions and food sample preparations.
- 2.To give knowledge about proximate composition of food.
- 3.To impart knowledge of colorimetry,spectroscopy,electrophoresis and atomic absorption spectrophotometry.
- 4.To impart knowledge on instrumentation in food analysis.
5. To impart knowledge on refractometry , ultrasonics ,texture analysis and immunoassays methods in food.

Detailed Syllabus

MODULE I
Preparation of chemical solutions: Concept of molar, molal, and normal solutions. pH and Buffers: Importance and measurement of pH. Introduction to food analysis, types of samples and sampling techniques, storage and preservation of samples, expression of results.
MODULE II
Proximate analysis of foods: Principles of moisture, fat, protein, carbohydrates, crude fiber and vitamins in foods.
MODULE III
Instrumentation in food analysis: principles, types and applications of colorimetry and raman spectroscopy, photometry, electrophoresis; High Pressure Liquid chromatography, Gas chromatography and atomic absorption spectrophotometry.
Module IV
Instrumentation in food analysis: color measurement in foods; X-ray analysis of foods and its applications; mass spectroscopy; nuclear magnetic resonance (NMR); differential scanning calorimetry (DSC).

Module V

Refractometry and ultrasonics in food analysis; texture analysis in foods, sensory versus instrumental analysis of texture, rapid methods of microbial analysis; immunoassays methods.
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Suggested Readings

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| 1. Chatwal, G.R. , ." Instrumental methods of chemical analysis"', Mumbai, Himalaya Pub. Pvt. Ltd, 2011. |
| 2. R G. Moreira, T.P Coultate "Automatic Control for Food Processing System"' . 2001. |
| 3. D. Patranabis, "Industrial Instrumentation"', McGraw Hill, 1990. |
| 4. B.G.Liptak,. Instrument Engineers Handbook: Process Measurement and Analysis"', 1995 |
| 5. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, Cambridge University. |

Course Outcomes:

After completing the course, students will be able to:

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| 1. Understand the method of preparation of chemical solutions and food samples. |
| 2. Understand the principles of proximate analysis in food. |
| 3. Understand about the different instrumentation involved in food analysis. |
| 4. Understand about advanced instrumentation in food analysis. |
| 5. Understand the refractometry, ultrasonics ,texture analysis and immunoassays methods in food. |

MFT-104 Food Microbiology

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr/week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objectives:

- 1.To give knowledge of general characteristics ,classification of microorganisms and their uses and source of contamination in food industry.
- 2.To give knowledge about factors affecting harmful microbes growth and lethal effects of various food processing techniques.
- 3.Gives knowledge of food microbiology, associated health risks and HACCP system.
- 4.To impart knowledge about food spoiling pathogens and their investigation methods.
- 5.To impart knowledge about food fermentation and associated starter cultures.

Detailed Syllabus

MODULE 1

Microbiology: Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; classification of microorganisms- a brief account; sources of microorganisms in foods; microbial growth, growth curve; factors affecting growth-intrinsic and extrinsic factors controlling growth of microorganisms, microbiological criteria of foods and their significance.

MODULE 2

Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservatives and high-pressure processing on the microbiology of foods; control of water activity and microbial growth, applications of hurdle technology for controlling microbial growth.

MODULE 3

Foods microbiology and public health: food poisoning, types of food poisonings, important features etc; bacterial agents of food borne illness, food poisoning by clostridium, salmonella, E. coli, bacillus, staphylococcus etc.; non-bacterial agents of food borne illness: poisonous algae, and fungi - a brief account, the HACCP system and food safety used in controlling microbiological hazards.

MODULE 4

Food spoilage and microbes of milk, meats, fish and various plant products, spoilage of canned foods; Indicators microorganisms, methods of isolation and detection of microorganisms or their products in food; conventional methods; rapid methods (newer techniques) - immunological methods; fluorescent, antibody, radio immunoassay, principles of ELISA, PCR (Polymerized chain reactions).

MODULE 5

Food fermentations: Bacterial, yeast and mold cultures; single and mixed cultures, propagation, maintenance and evaluation of cultures; factors affecting activity of cultures, bacteriophages, residual antibiotics and chemicals.

Suggested Readings

1.	Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New york.
2.	Microbiology by Pelczar, Smith & Chan.
3.	Food Microbiology by Frazier, 5 th edtn ,2017. Mc.Graw Hill Education.
4.	Food microbiology by V. Ramesh, MJP publishing.2007.

Course Outcomes:

After completing the course, students will be able to:

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| 1. Understand the different types of microorganisms and their structure. |
| 2. Understand the effect of various processing on food microbes. |
| 3. Understand about the food microbiology, associated health risks and HACCP system. |
| 4. Understand the different food spoilage and its causes with detection techniques too. |
| 5. Understand the microbiology of fermentation and starter cultures. |

MFT-105 Communication Skills and Technical Writing

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Class Test: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35

Course Objectives:

1. To give knowledge about vocabulary and word fluency.
2. To give knowledge about technical writing.
3. To give knowledge about effective communication skills.
4. To encourage students about interactive Communication Skills -Group Discussions, Debates, Conversations, Telephonic Etiquettes, Facing an interview.
5. To give knowledge about concept of community nutrition.

Detailed Syllabus

MODULE 1
Grammar: Expressions, Modals & Moods, Word Stress, Fluency, Voice, Enhancing Vocabulary Punctuations
MODULE 2
Introduction to Technical writing – Definition, types, characteristics, Report Writing, CV & Resume making, Research paper
MODULE 3
Effective Communication Skills: Power Point Presentations (Subject-Oriented), Soft Skills - Proper Body Postures, Right/Positive Body Language, Eye Contact, Public speaking, Interactive Communication Skills -Group Discussions, Debates, Conversations, Telephonic Etiquettes, Facing an interview
MODULE 4
Communication Skills: How to make Delivery of Content Effective, Proper Articulation, Modulation, Voice Throw, Proper Stress on Words, Presenting PPT's, Confidence Building, Motivation, Writing Covering Letters , Filling Application Forms.
MODULE 5
Technical Writing : Documentation of Academic credentials, Writing of Introduction, Acknowledgement, Abstract & Conclusion, Commonly used Abbreviations in the Thesis & Research Communication, Structuring the Presentation, Learning how to make PPT's, number of Slides, font, font size, Table Insertions, Picture, Clip Art, Chart, Grammatical Accuracy.

Suggested Readings

1.	Robert C. (Ed.). 2005. Spoken English: Flourish Your Language. Abhishek, Chandigarh.
2.	Shelton James H. 1994. Handbook for Technical Writing. NTC Business Books, Chicago.
3.	Wren PC & Martin H.2006. High School English Grammar and Composition. S. Chand, New Delhi.
4.	

Course Outcomes:

1.	Understand and apply knowledge of english communication in various contexts like interpersonal, intrapersonal, small group, organizational
2.	Find and write different academic writing more efficiently.
3.	Able to communicate effectively in interview as well as work place.
4.	Develop their personality and confidence
5.	Able to perform well in different competitive exams

MFT-106 Human Values and Ethics

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits: 0	Internal Assessment Marks[IAM]:15 [Class Test: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35

Course Objectives:

1. To give knowledge about needs of ethics and related practices.
2. To give knowledge about fair trade practices.
3. To give knowledge about property, rights, duties and their correlation
4. To encourage students about Patent rights/protection and procedure.
5. To give knowledge about International Registration systems and national policies on food security.

Detailed Syllabus

MODULE 1
The importance and the needs of ethics; Ethical business practices; Laws and ethics; Environmental protection;
MODULE 2
Creating awareness and safeguarding health of consumers; Fair trade practices.
MODULE 3
Concept of property, rights, duties and their correlation; History and evaluation of IPR; Copyrights and related rights. Distinction among various forms of IPR.
MODULE 4
Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical indication and Industrial design.
MODULE 5
International Registration systems; WIPO treaties; Unfair competition; Protection of new plant varieties; Legal implications and public concerns in genetic modification of foods; National policies on food security.

Suggested Readings

1. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
2. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
3. M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.
4. Agochiya D. 2002. Every Trainer's Handbook. Sage Publ.

Course Outcomes:

After completing the course, students will be able to:

1.	Understand the sensitivity of human values.
2.	Understand the outweigh of commitment and responsibility.
3.	Understand and realize the professional ethics for a healthy and hassle free professional life.
4.	Develop some significant qualities to contribute for the organization as well as the entire society.
5.	Bring the peace and harmony to the society.

MFT 151-Food Processing and Preservation Laboratory

Teaching Scheme	Examination Scheme
Practicals:4 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objectives:

1. To give practical knowledge of fruits and vegetables processing and preservation methods.
2. Provides practical knowledge of various food groups like frozen food,emulsions.
3. Gives knowledge of various adulteration tests and their principles.

Detailed Syllabus

1. Fruit & Vegetable Processing; Use of Chemical Additives for Preservation; Thermal Processing of Foods – Preparation of Jams, Jellies, Squashes, Pickles, Chutneys, Sauces.
2. Dehydration & Evaporation – Preparation of Condensed Milk
3. Emulsions-Preparation of Mayonnaise
4. Frozen Foods – Preparation of Ice Cream & Fruit/ Vegetable Pulp
5. Determination of gelatinization.
6. Stages of sugar cookery.
7. Estimation of gluten content.
8. Adulteration tests in various food samples.
9. Amylose and amylopectin content in rice.
10. Parboiling of rice.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the different fruits and vegetables processing methods and preservation.
2. Understand the preparation of emulsions and frozen foods.
3. Understand about various adulteration tests and their principles.

MFT 152-Food Chemistry Laboratory	
Teaching Scheme	Examination Scheme
Practicals:4 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objectives:

- 1.To give practical knowledge of food chemistry.
- 2.Provides practical knowledge of various food proximate analysis.
- 3.Gives knowledge of use of many lipid test and calorific value of food.

Detailed Syllabus

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| <ol style="list-style-type: none"> 1. Qualitative analysis of carbohydrates 2. Qualitative analysis of proteins 3. Estimation of carbohydrates in food materials 4. Estimation of proteins in food materials 5. Estimation of crude fibre in food materials 6. Estimation of ascorbic acid in food materials 7. Estimation of calorific value of foods 8. Analysis of Lipids: Free fatty acid, Peroxide value, Saponification value, RM Number, TBA test, Iodine value 9. Determination of NaCl content in food products. |
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Course Outcomes:

After completing the course, students will be able to:

1. Understand the different concepts behind food proximate analysis.
2. Understand the qualitative test of carbohydrates and proteins.
3. Understand about the different lipid analysis tests.
4. Understand the working of food analysis equipments.

MFT 153-Food Analysis and Instrumentation Laboratory	
Teaching Scheme	Examination Scheme
Practicals:4 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objectives:

- 1.To give practical knowledge of food equipments testing and their instrumentation.
- 2.Provides practical knowledge of various food analysis methods.
- 3.Gives knowledge about use of many equipments.

Detailed Syllabus

<ol style="list-style-type: none"> 1. Mathematical calculations in analysis- Concentration calculations, Ppm, Ppb, mg/1, Kg/ha, % normal, Molar Ug/100 gm calculations. 2. Qualitative and quantitative estimation of proteins by spectrophotometer. 3. Estimation of lactose in milk. 4. Estimation of Beta-Carotene in Foods. 5. Spectrophotometric estimation of carbohydrate. 6. Determination of microbial count. 7. Determination of yeast and mould count. 8. Instrumentation –Operation and Working of (Demo only) G.C.-Gas Chromatograph H.P.L.C.-High Pressure Liquid Chromatography A.A.S.- Atomic Absorption Spectrophotometer.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the different mathematical calculations for food analysis.
2. Understand the basics of analysis using spectrophotometer.

MFT-201 Technology of Fruits and Vegetables

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week	Internal Assessment Marks[IAM]:30
Tutorials:1 hr./ week	[Class Test: 12, Teachers assessment: 6,Attendance: 12]
Credits: 4	End Semester Marks[ESM]: 70

Course Objectives:

- 1.To give knowledge of chemical composition of fruits and vegetables,their pre processing operations.
- 2.To give knowledge about technology of fruits and vegetable products processing in various forms.
- 3.Gives knowledge of technology of tomato and its products preparation.
- 4.To impart knowledge on technology for new product formulation and utilization of food industry wastes.
- 5.To give knowledge of tea, coffee, cocoa, vinegar processing and pectin production.

Detailed Syllabus

MODULE 1
Classification and composition of fruits and vegetables and their nutritional significance; climacteric and non-climacteric fruits; post harvest treatments, edible coatings. Physical and chemical indices of fruit maturity, crop maturity and ripening, bio-chemical changes during maturation, ripening, processing and storage. Pre-processing operations: washing, blanching, peeling, sorting and grading of fruits and vegetables; minimal processing of fruits and vegetables; quality factors for processing, export standards, fruit product order (FPO).
MODULE 2
Technology of jam, jellies, marmalades, specifications, role of pectin and theories of gel formation. Technology for juice pressing, juice extraction and clarification, methods of bottling, enzymatic clarification and debittering of juices, physiological and enzymological aspects of fruit juice production, fruit juice concentrates and powders- preparation and specifications, packaging. Fruit juice beverages, squash, cordial, crush, RTS, nectar, syrups, blending of juices.
MODULE 3
Technology of tomato products: sauce, puree, ketchup and tomato paste.Fruit preserves and candied fruits, dehydrated fruits & vegetables, spoilage of processed products. Canning of fruits and vegetables, preparation of syrups and brines, spoilage of canned fruits and vegetables.
MODULE 4

Stages of new product development, by products from fruit and vegetable wastes, utilization and disposal of fruit industry wastes. Production of mushroom and its processed products; Cashew and coconut: chemical composition, processing technology and their processed products.

MODULE 5

Vinegar: Method of preparation and quality control.

Raw material processes and uses of pectin, products based on pectin, manufacturing and quality.

Suggested Readings

1. Haard, N.F. and Salunkhe, D.K. 1975. Postharvest Biology and Handling of Fruits and Vegetables. AVI, Westport.
2. Preservation of Fruits and Vegetables–Girdhari Lal, Siddhapa and Tondon, ICAR, New Delhi.
3. Salunkhe, D.K. and Kadam, S.S. Ed. 1998. Handbook of Vegetable Science and Technology. Marcel Dekker, New York, USA.
4. Wills, R.B.H., McGlasson, W.B., graham, D., Lee, T.H. and Hall, E.G. 2016. Postharvest: An Introduction to the Physiology and Handling of Fruits and Vegetables. BSP Professional Books, Oxford.
5. Hand Book of Analysis and Quality Control of Fruits & Vegetable Products–S. Ranganna Tata McGraw Hill, New Delhi.

Course Outcomes

After completing the course, students will be able to:

1. Understand the different fruits and vegetables chemical composition. and their pre processing operations.
2. Gives knowledge about fruit and vegetables products preparation methods and technology involved.
3. Imparts knowledge about tomato products preparation methods and technology involved.
4. Understand the stages of new product formulation and food industry waste utilization .
5. Technology of vinegar, tea, cocoa and pectin production.

MFT-202 Unit operations in Food Engineering

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week	Internal Assessment Marks[IAM]:30
Tutorials: 1 hr./week	[Class Test: 12, Teachers assessment: 6,Attendance: 12]
Credits: 4	End Semester Marks[ESM]: 70

Course Objectives:

- 1.To give knowledge of preliminary unit operations ,material handling, cleaning,sorting and grading in food industry.
- 2.To give knowledge about engineering principles of various unit operations in food industry.
- 3.Gives knowledge of engineering of unit operations associated with preservation, pasteurization evaporation and dehydration techniques.
- 4.To impart knowledge about refrigeration,freezing engineering.
- 5.To impart knowledge about technological principles of freezing operations, freezing systems.

Detailed Syllabus

MODULE 1

Preliminary unit operations – material handling, cleaning, sorting and grading.

Material handling–theory, classification of various material handling equipments, conveyors and elevators .

Cleaning – types of contaminants found on raw foods, aims of cleaning, methods of cleaning dry, wet and combination methods; dry cleaning methods - screening, aspiration, magnetic cleaning and abrasive cleaning; wet cleaning methods- soaking, spray washing, flotation washing and ultrasonic washing.

Sorting and grading – advantages of sorting and grading, grading factors, methods of sorting and grading.

Engineering properties of food materials

MODULE 2

Conversion unit operations – size reduction, mixing and filtration.

Size reduction- benefits of size reduction, nature of forces used in size reduction, criteria of size reduction, equipment selection (hardness of feed, mechanical structure of feed, moisture content and temperature sensitivity of feed); mode of operation of size reduction equipment – open circuit and closed circuit grinding, free crushing, choke feeding and wet milling; size reduction of solid foods, fibrous foods and liquid foods; effects of size reduction on solid and liquid foods.

Mixing – mixing terminology (agitating, kneading, blending, and homogenizing), mixing equipments – mixers for liquids of low or moderate viscosity (Paddle agitators, turbine agitators and propeller agitators), mixers for high viscosity pastes (Pan mixer, horizontal mixer and dough mixer), mixers for dry solids (tumbler mixer & vertical screw mixer); effects of mixing on foods.

Filtration – filtration terminology (feed slurry, filtrate, filter medium, filter cake and filter), filtration methods/equipments – pressure filtration, vacuum filtration, & centrifugal filtration.

MODULE 3
Preservation unit operations (high temperature operations)- pasteurization, evaporation and dehydration. Pasteurization– basic concept, effects of pasteurization on foods. Evaporation – main functions of evaporation, factors affecting the rate of heat transfer, factors influencing the economics of evaporation, evaporation equipments –horizontal tube evaporators, vertical tube evaporator and plate evaporator; single and multiple effect evaporators. Dehydration – objectives of dehydration, dehydration terminology, basic dehydration theory; drying curves, dehydration systems – tray drier, tunnel drier, drying time calculations.
MODULE 4
Preservation unit operation (low temperature operations) - refrigeration, freezing and freeze drying. Refrigeration – introduction, components of refrigeration systems – compressor, condenser and expansion valve; mechanical refrigeration system. Mechanical separations-Centrifugation and Sedimentation.
MODULE 5
Freezing – technological principles of freezing operations, freezing systems- direct contact and indirect contact system; influence of freezing rate on food system; freezing time calculations. Freeze drying – conventional drying vs freeze drying; equipments used and effects of freeze drying on food quality.

Suggested readings
1. S. K. Sharma, S.J.Mulvaney, and S.S.H.Rizvi, Food Process Engineering: Theory and Laboratory Experiments, Wiley and Sons, 2000.
2. H. Pandey, H.K. Sharma, R.C. Chauhan, B.C. Sarkar and M.C. Bera, Experiments in Food Process Engineering, CBS Publishers and Distributors, 2004.
3. M.A. Rao, S.S. H.Rizvi and A.K.Dutta, Engineering properties of Foods, 3rd ed., Marcel Dekker, 2005.

Course Outcomes:

After completing the course, students will be able to:

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|---|
| 1. Understand the preliminary unit operations in food industry. |
| 2. Understand engineering principles of various unit operations in food industry. |
| 3. Understand engineering of unit operations associated with preservation, pasteurization evaporation and dehydration techniques. |
| 4. Understand the refrigeration,freezing engineering. |
| 5. Understand about freezing systems in food. |

MFT203: Research Methodology, Statistics and Computer Applications

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week	Internal Assessment Marks[IAM]:30
Tutorials: 1 hr./week	[Class Test: 12, Teachers assessment: 6,Attendance: 12]
Credits:4	End Semester Marks[ESM]: 70

Course Objectives:

1. To give scientific approach to research and its types.
2. To give knowledge about sampling design, measurements and their central tendency.
3. To impart knowledge about experimental designs, measures of variability, correlation and various statistical tests.
4. To impart knowledge about introduction of computer science and technology, application softwares.

Detailed Syllabus

MODULE I
Research: significance, conceptualization of problem – hypothesis, Types of research – Research designs, fundamental, applied – action, exploratory, discipline, experimental, survey, case study and ex post facto. Longitudinal, cross sectional and correlational research.
MODULE 2
Theory of probability – population sample. Sampling techniques: Research methods – Interview schedule, important methods and data collection, interpretation of results, observation, social mapping, participatory rapid assessment. Writing up research reports and proposal.
MODULE 3
Statistics – meaning, role of statistics in research- descriptive research – classification, tabulation of data – graphic and diagrammatic representation of data. Measurement of central tendency , variation, dispersion, normal distribution – Mean, median, testing levels of significance – ‘T’ test, F test and X^2 test.
MODULE 4
Correlation, coefficient of correlation – rank correlation, analysis of variance, types, regression and forecasting–Fitting regression curves, discrimination analysis.
MODULE 5
Computer applications: MS office-word, excel, power point, internet, photoshop. Statistical software packages used in research. Software controlled food processing operations, application part in food industry. Software applications for quality control.

Suggested Readings

1. Elhance, D.L. (2008). Fundamentals of Statistics. Kitab Mahal, Patna.

2. Garret H.P. (2004). Statistics in Psychology and Education. Vallies Fotter and Simons Ltd. Bombay.
3. Kothari, C.R. (2008) Research Methodology. Wishwa Prakashan. New Delhi, India. Rao, K.V. (2007) Biostatistics. Jaypee Brothers medical publishers, New Delhi.
4. Sundar, R.P. & Richard, J. (2003). An Introduction to Biostatistics. Prentice Hall, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

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|---|
| 1. Understand the methods and role of scientific approach to research. |
| 2. Understand the various experimental designs, methods of sampling their analysis and data collection. |
| 3. Understand about the different terminology related to measurements, correlation, regression central tendency. |
| 4. Knowledge about test of significance of difference between means like t test, z test, chi square test, ANOVA. |
| 5. Knowledge of correlation and regression. |
| 6. Computer applications in food technology like response surface methodology and MS office applications: MS Office |

MFT204: Technology of Oil Seeds and Legumes

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./ week Credits:4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objectives:

1. To give knowledge about legumes and oilseeds production and processing in world.
2. To give knowledge about soyabean processing and value addition.
3. To impart knowledge about various edible oil sources and their processing technology.
4. To impart knowledge about oil based food emulsions preparation.

Detailed Syllabus

MODULE I
Status, production and major growing areas of legumes and oilseeds in India and world; structure and chemical composition of pulses and oilseeds; nutritional and antinutritional factors. Milling scenario of pulses in India, milling techniques: dry milling and wet milling; processing of legumes: soaking, germination, decortication, cooking, fermentation; puffing, roasting and parching; utilization of pulses; protein isolates and concentrates; role of legumes in human nutrition.
MODULE 2
Processing and utilization of soyabean for value added products; soy based fermented products; innovative products from pulses and oilseeds; future developments in products and processes; products from legumes and uses: starch, flour, protein concentrates and isolates.
MODULE 3
Sources of edible oils (groundnut, mustard, soyabean, sunflower, safflower, coconut, sesame and oil from other sources); physio-chemical properties; processing of oilseeds: rendering, pressing, solvent extraction, refining, hydrogenation; factors affecting extraction; packing and storage of fats and oils, changes during storage.
MODULE 4
Oil specialty products: margarine, mayonnaise, salad dressing, fat substitutes etc; chemical adjuncts: lecithins and GMS.

MODULE 5

Nutritional food mixes from oilseeds: processing of oilseeds for food use, protein rich foods, protein enriched cereal food.
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Suggested readings

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| 1. Hamilton, R.J. and Bharti, A. Ed. 1980. Fats and Oils: Chemistry and Technology. Applied Science, London. |
| 2. Salunkhe, O.K. Chavan, J.K, Adsule, R.N. and Kadam, S.S. 1992. World |
| 3. Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York. |

Course Outcomes:

After completing the course, students will be able to:

1.Understand the legumes and oilseeds production and processing in world.

2. Understand the soyabean and its various products processing and value addition.
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3.Understand about the different edible oil sources and their processing
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4.Knowledge about oil based food emulsions preparation.

5.Understand the preparation of nutritional food mixes from oilseeds.

MFT 205: Technology of Meat ,Fish and Poultry Products

Teaching Scheme	Examination Scheme
Lectures: 3hrs./ week Tutorials: 1 hr./ week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objectives:

- 1.To give an overview about meat and poultry products industry,its composition,its aging and related phenomena.
- 2.To give knowledge about eating quality and meat analogues.
- 3.To impart knowledge about egg and its preservation methods.
- 4.To impart knowledge poultry meat.
- 5.To impart knowledge about fish and its processing.

Detailed Syllabus

MODULE 1

Status and scope of meat industry in India; Structure and physico-chemical properties of Muscle meat: composition and nutritive value, conversion of muscle into meat, post mortem changes in meat, rigor mortis, cold shortening, pre-rigor processing; stunning and slaughtering methods.

Aging of meat, meat tenderization- natural and artificial methods; cooking methods for meat: roasting, frying and braising; storage and preservation of meat: chilling, freezing, curing, smoking, dehydration, freeze-drying, irradiation, canning.

MODULE 2

Cooking, palatability and eating quality of meat, microbial spoilage of meat; restructured meat products (sausages), meat analogs; meat industry by products: importance and applications; intermediate moisture and dried meat products; meat plant hygiene and good manufacturing practices; packaging of meat products.

MODULE 3

Egg: Structure, composition and nutritive value of eggs, Storage and shelf life problems
Quality evaluation of eggs: international and external quality evaluation, candling, albumen index, Haugh unit, yolk index etc.

Egg preservation: grading of eggs, whole egg preservation, pasteurization, dehydration, freezing, egg products: egg powder, value added egg products (e.g., Meringues and Foams etc.), packaging of egg and egg products.

MODULE 4

Poultry products: types, chemical and nutritive value of poultry meat, slaughtering and evaluation of poultry carcasses; poultry cut-up parts and meat/bone ratio; preservation, grading and packaging of poultry meat.

MODULE 5

Fish processing: factors affecting quality of fresh fish, fish dressing, chilling, freezing, glazing, salting and canning of fish; manufacturing of fish paste, fish oil, fish protein concentrate and fish meal; by-products of fish industry and their utilization. Shell fish processing.

Suggested readings

1.	BD Sharma. Meat and Meat Products Technology, Jaypee Brothers Medical Publishers. 1999.
2.	Kerry J. et al. 2002. Meat Processing. Woodhead Publ. CRC Press.
3.	Pearson AM & Gillett, TA. 1996. Processed Meat. 3rd Ed. Chapman & Hall.
4.	Hui YH. 2001. Meat Science and Applications. Marcel Dekker. 32

Course Outcomes:

After completing the course, students will be able to:

- | |
|---|
| 1. Understand about meat and poultry products industry, its composition, its aging and related phenomena. |
| 2. Understand the various eating quality and meat industry products. |
| 3. Understand about the egg and its preservation methods. |
| 4. Understand the poultry and its products preservation. |
| 5. Understand the basic of fish processing. |

MFT206: Intellectual Property Rights

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Class Test: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35

Course Objectives:

- 1.To give an overview of IPR and its regime in India
- 2.To give knowledge about IPR benefits,patents and copyrights,trademarks .
- 3.To impart knowledge about protection laws for plant varieties and farmers.
- 4.To impart knowledge about International treaties on plant genetics,technologies and research collaborations.

Detailed Syllabus

MODULE 1
Need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement.
MODULE 2
Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties.
MODULE 3
Fundamentals of patents, copyrights, geographical indications, designs and layout, trademarks.
MODULE 4
Protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection.
MODULE 5
International Treaty on Plant Genetic; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement

Suggested readings

1.	Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI, Wallingford.
2.	Ganguli, Prabudha. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Understand about Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement.
2. Understand the IPR and its benefits.
3. Understand the basics of patents, copyrights, geographical indications, design and layout, trademarks
4. Understand the protection laws related to plant varieties and farmers.
5. Understand the International Treaties.

MFT207: Quality Control and Food Laws

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Class Test: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35

Course Objectives:

1. To give an overview about meat and poultry products industry, its composition and nutritive value in India.
2. To give knowledge about mechanism of rigor mortis, postmortem changes. factors affecting meat quality.
3. To impart knowledge about preservation methods of meat and poultry and meat tenderization techniques.
4. To impart knowledge about utilization of meat, poultry and fish industry by products.
5. .To impart knowledge about egg, its composition, processing, properties and poultry processing industry.

Detailed Syllabus

MODULE 1
Quality Assurance: Introduction, Importance and Difference. Food Quality and Food Safety: Scope and difference.
MODULE 2
Raw materials & Finished product quality: Quality parameters and evaluation procedures: Appearance, color, texture, viscosity, consistency, flavor. Sensory evaluation: Selection of panel of judges, sensory characteristics of foods, types of tests.
MODULE 3
Food standards and laws: International – Concept of Codex alimentarius, HACCP, GMP, GHP, USFDA, ISO 9000, ISO 22000, ISO 14000. National – Introduction of BIS/IS, Food Safety and standards – 2006, Food Safety and standard regulation 2010, FPO, MPO, MMPO, Agmark. Prevention of food adulteration Act: Food Adulteration: definition, common adulterants in different foods, contamination, methods of detection. Food additives and legislation; coloring matter, preservatives, poisonous metals, antioxidants and emulsifying and stabilizing agents, insecticides and pesticides. PFA specification for food products, Nutritional labeling
MODULE 4
Quality Certification & Accrediation: Introduction and procedure.
MODULE 5

Water Quality: Water standards and Analysis physical, chemical and microbiological characteristics of water analysis. Waste treatment: Fundamentals of Physical, Biological & Chemical waste treatments.

Suggested readings

1. Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI Wallingford.
2. Ganguli, Prabudha. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Understand about Intellectual Property Right regime; TRIPs and various provisions in TRIPs Agreement.
2. Understand the IPR and its benefits.
Understand the basics of patents, copyrights, geographical indications, design and layout, trademarks.
3. Understand the protection laws related to plant varieties and farmers.
4. Understand the International Treaties.

MFT-251 Technology of Fruits and Vegetable Laboratory	
Teaching Scheme	Examination Scheme
Practicals:4 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objectives:

- 1.To give practical knowledge about processing of fruits and vegetables products.
2. To attain expertise in Vegetable and Fruit Maturity Index Determination and Calculation.

Detailed Syllabus

<ol style="list-style-type: none"> 1.Preparation of Vegetable Products. 2.Preparation of Fruit Products. 3.Preparation of Dehydrated Fruits and Vegetables. 4.Preparation of Dried Figs and Raisins. 5. Vegetable and Fruit Maturity Index Determination and Calculation. 6. Quality Standard Measurements of Vegetable and Fruit Products.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the different methods of preparation of Fruits and vegetables various products.
2. Understand the techniques to be employed in determining the activity Vegetable and Fruit Maturity Index Determination and Calculation.

MFT-252 SEMINAR

Teaching Scheme	Examination Scheme
Practical:2 hrs./week Credits: 1	Internal Assessment Marks:50

Course Objectives:

1. To prepare the students for compiling the knowledge and giving the presentation on any curriculum related topic so as to equip them with recent trends related to topic and also its effective delivery.

It's compulsory for all the students to give a seminar on the topic assigned by the Department of food technology in the starting of the semester, in the supervision of the assigned supervisor. If the discussion session of seminar / presentation is not found satisfactory then the next date for the said presentation will be given immediately.

Presentation Time duration : 30 - 45 minutes

Discussion duration : 15 - 20 minutes

Course Outcomes:

After completing the course, students will be able to:

Compile the essence of any given topic in the form of presentation and ensure its further effective delivery also by using recent technology in the teaching field.

MFT-253 Industrial training	
Teaching Scheme	Examination Scheme
Credits: 4	End Semester Marks[ESM]: 100 [Presentation: 50 marks, Viva:10, Report: 40 Marks]

Course Objectives

1. To attain expertise in hands on training in food technology.
2. To enable students observe, first hand, work flow and processes in food industries and associated enterprises.

It is compulsory for all the students to have 4 weeks internship in industry during winter break after 1st semester.

Course Outcomes:

After completing the course, students will be able to:

1. The student will be exposed to the diverse setting in food industries.
2. The student will be able to appreciate different processing and production technologies in various industrial settings

SCHEME OF EVALUATION
M.Sc. – FOOD TECHNOLOGY
2nd-YEAR, SEMESTER-III
(w.e.f. academic session 2021-2022)

S. No.	Category	Course Code	SUBJECT	PERIODS			CREDIT	MARKS		
				L	T	P		DISTRIBUTION		
								IAM	ESM	TOTAL
THEORY										
1	CC	MFT-301	Processing of Cereals, Pulses and Oilseeds	3	1	0	4	30	70	100
2	CC	MFT-302	Dairy Technology	3	1	0	4	30	70	100
3	CC	MFT-303	Food Packaging and Labelling	3	1	0	4	30	70	100
4	CC	MFT -304	Bakery and Confectionery Technology	3	1	0	4	30	70	100
5	DSE(2*)	MFT305	Fermentation and Microbial Technology	2	0	0	2	15	35	50
		MFT306	Specialty Foods							
6	GE(2*)	MFT-307	Beverage Technology	3	1	0	4	30	70	100
		MFT-308	Snack Food Technology							
PRACTICAL / TRAINING / PROJECT / SEMINAR										
7	Lab Courses	MFT-351	Dairy Technology Lab	0	0	4	2	15	35	50
8	Lab Courses	MFT-352	Beverage Technology Lab	0	0	4	2	15	35	50
9	Lab Courses	MFT-353	Snack Food Technology Lab	0	0	4	2	15	35	50
		Total		17	5	12	28	210	490	700
Abbreviations Used	L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks CC= Core Course, DSE=Discipline Specific Electives, GE-Generic Elective, AECC-Ability Enhancement Compulsory Core Courses, SEC=Skill Enhancement Course									

(*)Only one elective course is to be chosen out of the given two.

The elective subject for theory and practical will be same.

SCHEME OF
EVALUATION
M.Sc. – FOOD TECHNOLOGY
2nd-YEAR, SEMESTER-IV
(w.e.f. academic session 2021-2022)

S. No.	Category	Course Code	SUBJECT	PERIODS			CREDIT	MARKS DISTRIBUTION		
				L	T	P		IAM	ESM	TOTAL
THEORY										
1	CC	MFT-401	Entrepreneurship and Project Management	3	1	0	4	30	70	100
PRACTICAL / TRAINING / PROJECT / SEMINAR										
2	SEC	MFT-451	Dissertation/Project and Viva	0	0	20	24	0	300	300
Total				3	1	20	28	30	370	400
L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks, CC= Core Course, SEC=Skill Enhancement Course										

MFT 301 Processing of Cereals, Pulses & Oil Seeds

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week	Internal Assessment Marks[IAM]:30
Tutorials: 1 hr./week	[Class Test: 12, Teachers assessment: 6,Attendance: 12]
Credits: 4	End Semester Marks[ESM]: 70

Course Objective:

1. To create knowledge about the processing and quality evaluation of cereal grains.

Detailed Syllabus

Module 1
Wheat Technology: Composition of grain and environmental effects on its processing quality, enzymes of wheat and their role in the manufacture of wheat products; principles of wheat milling and its effect on composition of flour, aging of flour, byproducts, chemical improvers- bleaching and maturing agents, property of dough and its rheology, manufacture of wheat products bread, biscuits etc.; formulation of premixes for bakery products; pasta goods and processed cereal foods for infants.
Module 2
Rice Technology: Composition, type of proteins, starch content, amylose and amylopectin fractions; presence and effect of lipases; distribution of vitamins; minerals, and proteins in rice grain and its relation to milling; rice milling operations and its effect on nutritive value; cooking quality; byproducts of rice milling and their utilization; processed and prepared mixes based on rice.
Module 3
Legumes: Composition, anti-nutritional factors, processing methods, methods of cooking.
Module 4
Corn Technology: Composition, processing of corn for manufacture of corn grits, meal and flour; manufacture of corn flakes, corn syrup, cornstarch, corn steep liquor, corn oil and canned corn. Composition and Processing of millets like barley, sorghum. Oats etc.
Module 5

Oilseeds: Composition, processing of oilseeds as protein concentrations, properties and uses of oilseeds meals, technology vegetable protein isolates; Barrier compounds in the utilization of oil seed proteins. Low cost protein foods from oilseeds.

Suggested Readings

1. Hosene, R.S. (1994). Principles of Cereal Science and Technology. 2nd Ed. AACC.
2. Chakrabarty, M.M. (2003). Chemistry and Technology of Oils and Fats. Prentice Hall.
3. Dendy, D.A.V., & Dobraszczyk, B.J. (2001). Cereal and Cereal Products. Aspen.
4. Hamilton, R.J., & Bhati, A. (1980). Fats and Oils - Chemistry and Technology. App. Sci. Publ.
5. Kay, D.E. (1979). Food Legumes. Tropical Products Institute.

COURSE OUTCOMES

After completing the course, students will be able to:

1. Student will acquire the understanding of the technology for Wheat Milling & Wheat based Food Products.
2. Student will acquire the understanding of the technology for Rice Milling & Rice based other Food Products.
3. Student will acquire the understanding of working of equipments related to Legumes Processing along with equipments.
4. Student will be able to understand technology for Milling of Corn & Corn based other Food Products along with equipments.
5. Student will be able to understand technology for Oil Seed Processing & Oil Extraction from various sources along with equipments.

MFT 302 Dairy Technology

Teaching Scheme Lectures: 3 hrs./ week Tutorials: 1 hr./week Credits: 4	Examination Scheme Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70
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Course Objective:

1. To impart knowledge about processing of milk and its products and legislation for the quality control of milk and milk products.

Detailed Syllabus

Module 1

Introduction: Physicochemical properties of milk, Platform tests, Chemical composition and nutritive value of milk, Factors affecting composition of milk. Importance of milk industry in India: Collection, chilling, transportation, cream separation, standardization, pasteurization, sterilization, homogenization, packaging, storage and distribution of fluid milk, Ultrahigh temperature processed milk.

Preparation of various types of milks: Toned, homogenized, fortified, reconstituted and flavored milk. Technology of fermented milk products: Principles and practices of manufacture, packaging, storage and marketing of Dahi, cultured butter milk, acidophilus milk etc.

Module 2

Cheese: Manufacture of hard, semi hard, soft and processed cheeses. Storage, grading and marketing of cheese, cheese defects and their control. Butter: Manufacture, packaging, storage and marketing of butter; butter defects and their control, margarine.

Module 3

Technology of frozen milk products: Classification, manufacture, packaging, storage and marketing of ice cream, ices, sherbets etc. defects of frozen products and their control. Technology of evaporated and dried milk: Manufacture of evaporated milks and milk powders. Packaging storage defects and their control. Technology of condensed milk: Manufacture of condensed milks, Packaging storage defects and their control.

Module 4

Technology of dairy by products: Utilization of skim milk, buttermilk and whey for the manufacture of casein, lactose etc. Technology of indigenous milk products: Principles and practices of manufacture, packaging, storage and marketing of ghee, Khoa, Chenna, shrikhand, paneer, rasogulla, gulab jamun and Milk based foods Preparation of soft curd milk, vitaminized milk, standardized milk, filled milk and imitation milk.

Module 5

Sanitary aspects of dairy plant building, equipment and their maintenance. Disposal of dairy plant waste. Application of membrane technology in dairy industry.

Suggested Reading

1. Dey, Sukumar. 1994. Outlines of Dairy Technology. Oxford Univ. Press, New Delhi.
2. Considine, D.M. Ed. 1982. Foods and Food Production Encyclopaedia, VNR, New York.
3. Robinson, R.K. (2 vol. set). 1986. Modern Dairy Technology Elsevier Applied Science, UK.
4. Rosenthal, I. 1991. Milk and Milk Products. VCH, New York.
5. Warner, J.M. 1976. Principles of Dairy Processing. Wiley Eastern Ltd. New Delhi.

COURSE OUTCOMES

After completing the course, students will be able to:

1. Composition and types of milk and milk products.
2. Processing of cheese
3. Technology of various frozen milk products.
4. Technology of dairy by products utilization
5. To understand membrane technology and sanitary aspects of dairy plant building, equipment with disposal of dairy plant wastes

MFT 303 Food Packaging and Labelling

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1.To acquaint the students with packaging methods, packaging materials, packaging machineries, modern packaging techniques, food labeling guidelines as well. etc.

Detailed Syllabus

Module 1
Introduction to packaging. Packaging operations, package-functions and design. Principles of protective packaging. Deteriorative changes in foodstuff. Shelf life of packaged foodstuff, packaging methods to extend shelf-life. Packaging materials: origin, types, chemistry, morphology and physical characteristics, advantages, defects and risks.
Module 2
Food containers: Rigid containers, corrosion of containers (tin plate). Flexible packaging materials and their properties. Food packages-bags, pouches, wrappers, carton and other traditional packages. Containers-wooden boxes, crates, plywood and wire bound boxes, corrugated and fibre board boxes, textile and paper sacks.
Module 3
Challenges in food packaging, considerations in the packaging of perishable and processed foods. Evaluation of packaging material and package performance, WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test. Packaging equipment, package standards and regulation.
Module 4
Shrink packaging. Bar coding, aseptic and retortable pouches. Flexible and laminated pouches, Aluminum as packaging material. Biodegradable packaging. Active packaging, smart packaging and intelligent packaging.
Module 5
FSSAI regulations of food labeling - CAC guidelines for food labeling. FOSHU Nutritional labeling and education act 1990- mandatory nutritional labeling, nutrient content claims, health claims, national uniformity for food act, 2005.

Suggested Readings

1. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor and Francis Group, 2012
2. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003
3. Paine FA and Paine HY, A Handbook of Food Packaging, Blackie Academic and Professional, 1992.

Course Outcomes

After completing the course, students will be able to:

1. Will able to know basics of packaging,its functions and shelf life of various food stuffs.
2. To understand about packaging materials, methods and their applications in food industry.
3. Evaluation methods of packaging materials
4. To understand the shrink wrapping,bar coding and biodegradable packaging
5. To understand the regulations related to food labelling

MFT 304 Bakery and Confectionery Technology

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To acquaint students with production and processing technologies for product development and value addition of various bakery and confectionery products.

Detailed Syllabus

Module I
Principles of Baking Raw Material and their Role – flour, leavening agents, sugars, fats, additives, spice,Types of Bakery Products and Technology for their Manufacture – dough and batters; cakes, pies, pastries, bread, biscuits Icings and Fillings.
Module 2
Quality Parameters of Bakery Products - chemistry of dough and batters; rheological testing and interpretation of data; sensory evaluation Staling and Nutrient Losses in Bakery Products ,Sanitation and Hygiene in a Bakery Unit Equipment used in the Bakery Industry .
Module 3
Principles of Confectionery Manufacture.Raw Material and their Role – interfering agents, inversion of sugars, etc. Types of Confectionery Products and Technology for their Manufacture.Quality Parameters of Confectionery Products.Nutrient and other Losses in Confectionery Products.Sanitation and Hygiene in a Confectionery Unit .Equipment used in the Confectionery Industry.
Module 4
Sugar- Manufacturing of sugar, types of sugar, byproducts, jaggery, honey.. Additional ingredients: colours, flavors, gums, pectin and gelatin, chocolate processing. Types: imitation chocolate, milk chocolate. Crystalline and non crystalline candies.
Module 5
Chocolate – raw material, types, and manufacture, Ingredients of chocolate-sucrose, invert sugars, corn syrup, non-nutritive sweeteners, sugar substitutes

Chewing Gum - raw material, types, and manufacture

Pan Coating – hard and soft panning; problems in coating; glazing, polishing, and tableting Nutritional Value, Quality Parameters.

Suggested readings

1. Samuel, A.M.(1996) “ *The Chemistry and Technology of Cereals as Food and Feed* “, CBS Publisher & Distribution, New Delhi.
2. Pomeranz, Y.(1998) “ *Wheat : Chemistry and Technology*”, Vol 1,3” Am. Assoc. Cereal Chemists. St. Paul, MN, USA.
3. Hosney, R.C.(1986) “ *Principles of Cereal Science and Technology*”, Am. Assoc. Cereal Chemists, St. Paul, MN, USA.
4. Pomeranz, Y. (1993) “ *Advances in Cereal Science and Technology*”, Am. Assoc. Cereal Chemists St.Paul, MN, USA.
5. Dubey SC. 2002. Basic Baking. The Society of Indian Bakers, New Delhi.

Course Outcomes

1. Ability to understand the basic concepts of baking and role of various raw materials involved.
2. Ability to understand chemistry of dough chemistry and rheological testing.
3. Acquire knowledge of Principles of Confectionery its manufacture. and their Role.
4. Understand the sugar ,its type and related processing.
5. Understand the chocolate manufacturing,chewing gumand pan coating basics.

MFT 305 Fermentation and Microbial Technology

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits:2	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To familiarize about the various microbial processes/systems/activities which have been used for the development of industrially important products/processes.

Detailed Syllabus

Module 1
Fermentation: History, definition and types. Study of a Bio fermentor – its design and operation, Down Stream Processing and Product recovery. Its measurement and control in fermentation, Aeration and agitation in fermentation: Oxygen requirement, sterilization of air and media; scale up in fermentation.
Module 2
Recovery of particulate matter, product isolation, distillation, centrifugation, whole brothprocessing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis.
Module 3
Production of alcoholic beverages, organic acids, enzymes and immobilization of enzymes. Biological waste treatment.
Module 4
Dairy Fermentations-starter cultures and their types, concept of probiotics.
Module 5
Microbial enzymes, role in various industrial processes, Bio-transformations, Immobilized enzymes based bioreactors; production of antibiotics, vaccines, and biocides; Bioconversion of substrates, anti-nutritional factors present in feeds; Microbial detoxification of aflatoxins;

Bioinsecticides; Biofertilizers.

Suggested Readings

1. Vogel, H.C. and C.L. Todaro, 2005 Fermentation and Biochemical Engineering Handbook: Principles, Process Design and Equipment, 2nd Edition, Standard Publishers.
2. El-Mansi, E.M.T, 2007, Fermentation Microbiology and Biotechnology 2nd Edition, CRC / Taylor & Francis.
3. Joshi, V.K. and Ashok Pandey, 1999, Biotechnology: Food Fermentation, Microbiology, Biochemistry and Technology, Vol. I & vol. II Educational Publisher.
4. Pepler, H.J. and D. Perlman, 2004, Microbial Technology: Fermentation Technology, 2nd Edition, Vol. II Academic Press / Elsevier.
5. Stanbury, P.F., A. Whitaker and S.J. Hall, 2005 Principles of Fermentation Technology, 2nd Edition Aditya Books (P) Ltd.

Course Outcomes

1. Understanding the fermentation, bioreactor, downstream processing and various factors affecting fermentation process.
2. Understand the Recovery of particulate matter and its methods.
3. Understand principles of alcoholic beverage production and immobilization of enzymes.
4. Understand dairy fermentation and starter culture methods.
5. Knowledge about microbial enzymes, role in various industrial processes, Bio-transformations

MFT 306 Specialty Foods

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./ week Credits: 2	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To make students understand the need, importance and process of developing healthy and nutritious foods for special category of population groups.

Detailed Syllabus

Module 1
Need and scope of specialty foods: Specialty food based on ease in preparation cost health benefits; Functional foods, Convenience food, Health care and medical benefits, Nutritional status, Low cost foods.
Module 2
Specialty foods based on sources; Cereals and millets, Legumes and pulses, Fruits and vegetables, Animal food sources, By product based, Non conventional foods.
Module 3
Specialty foods based on process; Innovative process technology, Food additives basis, Bioactive components, Novel nutraceuticals products, Packaging techniques, Adaptable technology basis, Fast and PET foods.
Module 4
Specialty food based on genetics; Genetically modified foods, Transgenic foods Biotechnological aspects of detoxification. Proprietary foods. Supplementary foods.
Module 5
Therapeutic foods; Specific consumer oriented foods; Defence persons, Space / astronaut, High altitude mountain climbers, Disaster situation – crises, care, maintenance. Specialty foods based on growing condition -organic, inorganic farming.

Suggested Readings

1. Gibson GR & William CM. 2000. Functional Foods - Concept to Product.
2. Robert EC. 2006. Handbook of Nutraceuticals and Functional Foods.Ed. Wildman.
3. Manson P.2001. Dietary Supplements. 2nd Ed. Pharmaceutical Press.
4. Bamji MS, Rao NP & Reddy V. 2003. Textbook of Human Nutrition. Oxford & IBH.

Course Outcomes

1. After completion of course the students would have an understanding of various specialty foods.
2. Understand basic of various specialty foods and their sources,non conventional foods.
3. Understand principles of process technologies behind specialty foods.
4. Understand Specialty food based on genetics; Genetically modified foods, Transgenic foods like GMOs, transgenics etc.
5. Will have knowledge of therapeutic foods and customized food for target groups.

MFT 307 Beverage Technology

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To acquaint students with the particulars of manufacturing industrial beverages and to familiarize students with the quality requirements of bottled beverages.

Detailed Syllabus

Module 1

Water as an Industrial beverage, Status of Beverage Industry in India and globally, Types of Bottled Water – Mineral Water, Spring Water, Flavoured Water, Carbonated Water Packaged Drinking Water – Manufacturing Process, Raw and Processed Water, Water Treatment, Quality Standards of Bottled and Packaged Water

Module 2

Beverage Ingredients and their Functions – sweeteners, bulking agents, acidulants, flavourings, preservatives, Concentrated Beverages – ingredients, processing techniques, and standards
Carbonated Beverages - ingredients, processing techniques, and standards.
Fruit- and Vegetable-based Beverages – ingredients, processing techniques, and standards
Tea, "Coffee and Cocoa: Production and manufacturing'

Module 3

Synthetic Beverages - ingredients, processing techniques, and standards, Beverages used in the Sports Industry – types, ingredients, processing techniques, and standards, Indigenous Beverages for Domestic and Commercial Use – sugarcane juice, cashew apple extract, coconut palm sap.
Carbonated Alcohols – beer, champagne.

Module 4

Distillation and Distilled Liquors – whisky, rum, gin, vodka, brandy
Fermentation and Fermented Alcohols – wine, ciders, sake

Module 5

Indigenous Alcohol Production – urak, feni, toddy
Liqueurs and Aperitifs

Suggested Readings

1. Hui YH et al 2004. Handbook of Food and Beverage Fermentation Technology. Marcel Dekker.
2. Priest FG & Stewart GG. 2006. Handbook of Brewing. Second Edition. CRC.
3. Richard P Vine. 1981. Commercial Wine Making - Processing and Controls. AVI Publ.
4. Varnam AH and Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology. Chapman & Hall.
5. Woodroof JG and Phillips GF. 1974. Beverages: Carbonated and NonCarbonated. AVI Publ.

Course Outcomes

1. The student will gain an understanding of processing techniques used for water as an industrial beverage and its various standards .
2. The student will gain an understanding of processing ingredients and its functions used in the beverage industry.
3. The student will comprehend synthetic beverages and its types used for specific target groups.
4. Understand both distilled and undistilled beverage production.
5. Gain knowledge related to indigenous alcohol production and have concept of Liqueurs and Aperitifs.

MFT 308 Snack Food Technology

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To impart knowledge related to various snack foods and their manufacturing techniques.

Detailed Syllabus

Module 1
Extrusion: Introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses. Single screw extruder: principle of working, factors affecting extrusion process, co-kneaders. Twin screw extruder: Feeding, screw design, screw speed, screw configurations. Pre-conditioning of raw materials used in extrusion process: operations and benefits and devolatilization. Chemical and nutritional changes in food during extrusion. Addition and subtraction of materials, shaping and forming at the die. Post-extrusion processes- colouring, flavouring and packaging of extruded snack foods.
Module 2
Breakfast cereals: Introduction and classification (flaked cereals, oven puffed cereals, gun puffed cereals, shredded products). Breakfast cereal-manufacturing processes (traditional and modern methods), High shear cooking process and steam cookers.
Module 3
Texturized vegetable protein: definition, processing techniques. Direct expanded (DX) and third generation (3G) snacks: types. Concept of junk & fried foods and their impact on human health.
Module 4
Technology for grain-based snacks: Whole grains- roasted, toasted, puffed, popped, flaked. Coated grains- salted, spiced and sweetened. Formulation, processing and quality assessment of chips and wafers, papads, instant premixes of traditional Indian snack foods.
Module 5

Technology for fruit and vegetable-based snacks- chips, wafers; Technology for coated nuts- salted, spiced and sweetened chikkies. Equipments for frying, baking, drying, toasting, roasting, flaking, popping, blending, coating and chipping.

Suggested readings

1. Booth, R. G. (1997). Snack Food: CBS, New Delhi.
2. Raymond, W. L. & Rooney, L. W. (2001). Snack Foods Processing: CRC. London.
3. Lusas, E. W. & Rooney, L. W. (2015). Snack Foods Processing: CRC. London.
4. Guy, R. (2001). Extrusion Cooking: Technologies and Applications: Woodhead, USA.
5. Riaz, M. N. (2000). Extruders in Food Applications: Technomic, Lanchester.

Course Outcomes

1. Students shall be able to understand Basics of Preparing Extruded Snack Foods Items along with working of equipments related to extrusion of Food Products.
2. Students shall be able to understand preparation of Breakfast Snacks in particular cereal based Snacks Food Items.
3. Students shall be able to understand preparation of Texturised vegetable protein, concept of junk food and fried foods.
4. Students shall be able to understand preparation of Grain based Snacks Food Item.
5. Students shall be able to understand preparation of Fruits & Vegetables based Snack Item along with introduction of related equipments.

MFT-351 Dairy Technology Laboratory

Teaching Scheme	Examination Scheme
Practicals:4 hrs./week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objective:

1. To give practical knowledge of various test for milk.
2. Provides practical knowledge of adulteration testing.
3. Gives knowledge about preparation of toned, homogenized, fortified, reconstituted,fermentedand flavored milks, ice cream,butter,khoa,ghee,casein and chenna.

Detailed Syllabus

1. Platform test for raw milk.
2. Determination of moisture content in milk.
3. Dye reduction test.
4. Determination of fat content in Milk powders and ice-cream products.
5. Determination of Milk adulterants: Starch, Urea, Formaldehyde and Sugar, Hydrogen peroxide, salt and detergent.
6. Operation, cleaning and sterilization of dairy plant machinery involved in fluid milk processing
7. Preparation of toned, homogenized, fortified, reconstituted and flavored milks
8. Manufacture of fermented milks.
9. To study the kinetics of enzymes and manufacture of cheeses.
10. Manufacture of butter
11. Manufacture of ice- cream, ices, sherbats.

Course Outcomes:

After completing the course, students will be able to:

- 1.Understand the various platform and adulteration tests for milk.
2. Preparation of toned, homogenized, fortified, reconstituted,fermented and flavored milks, ice cream,butter,khoa,ghee,casein and chenna.
3. Students will know about operation, cleaning and sterilizaiton of dairy plant machinery involved in fluid milk processing.

MFT-352 Beverage Technology Laboratory

Teaching Scheme	Examination Scheme
Practicals:4 hrs./week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: 06] End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objective:

1. To give practical knowledge of various sensory tests for food products.
2. Provides practical knowledge about parameters of analysis of water.

Detailed Syllabus

1. Preparation of Non-Carbonated Beverages
2. Estimation of Sulphur Dioxide in Beverages
3. Estimation of Ascorbic Acid Content of Commercial Juices
4. Estimation of Phenolic Content in Beverages
5. Analysis of Mineral Content of Bottled Water
6. Analysis of Nutrient Content in Sports Drinks

Course Outcomes:

After completing the course, students will be able to:

1. Understand the various sensory tests used in food industry.
2. Understand the testing methods for alkalinity, acidity, hardness, pH , total plate count and coliformcount

MFT-353 Snack Food Technology Laboratory

Teaching Scheme	Examination Scheme
Practicals:4 hrs./week Credits: 2	Internal Assessment Marks[IAM]:15 [Record: 06, Teachers assessment: 03,Attendance: End Semester Marks[ESM]: 35 [Practical: 20 marks Viva:10, Record: 05 Marks]

Course Objective:

1. To give practical knowledge of various development of snack food products.
2. Provides practical knowledge about shelf life and quality characteristics of snack food products.

Detailed Syllabus

1. Preparation of Snack Foods based on Cereals
2. Preparation of Snack Foods based on Pulses
3. Preparation of Snack Foods based on Nuts
4. Preparation of Snack Foods based on Fruits
5. Preparation of Snack Foods based on Vegetables
6. Development of Instant Food Pre-Mixes
7. Determination of Shelf-Life and Quality Characteristics of Snack Foods

Course Outcomes:

After completing the course, students will be able to:

- 1.The student will be able to practically prepare snack foods from a variety of raw material .
- 2.The student will be competent in analysing the shelf life and quality of snack foods.

MFT 401 Entrepreneurship and Project Management

Teaching Scheme	Examination Scheme
Lectures: 3 hrs./ week Tutorials: 1 hr./ week Credits: 4	Internal Assessment Marks[IAM]:30 [Class Test: 12, Teachers assessment: 6,Attendance: 12] End Semester Marks[ESM]: 70

Course Objective:

1. To enable students to have firm grounding in entrepreneurship as they will get prepare competitive job market.

Detailed Syllabus

Module 1
Meaning, definition and concepts, characteristics, functions, entrepreneurial traits and motivation, role of entrepreneur in economic development, factors affecting entrepreneurial growth. Types of entrepreneurs - Entrepreneurship, Women entrepreneurship, significance, problems, solutions to the problems.
Module 2
Objectives, Steps, Need for training- target group- Contents of the training programme-Special Agencies for Entrepreneurial Development and Training-DIC.
Module 3
Meaning, Features, Classification, Project identification, Stages in project identification, Project Life Cycle, Project formulation Elements, Feasibility Analysis-Network Analysis-Project Planning.
Module 4
Government schemes and incentives for promotion of entrepreneurship; Government policy on small and medium enterprises (SMEs)/SSIs; Setting up of micro small and medium 10 10% enterprises, location significance, Green channel, Bridge capital, Seed capital assistance, Margin

money scheme, Sickness, Causes-Remedies.

Module 5

Export and import policies relevant to food processing sector; Venture capital; Contract farming and joint ventures, publicprivate partnerships; Overview of food industry inputs; Characteristics of Indian food processing industries and export; Social responsibility of business. SIDCO, SIDBI, NIESBUD, EDII, SISI, NREG Scheme- SWARNA JAYANTHI, RozgarYojana Schemes.

Suggested readings

1. Drucker, Peter (2014), “Innovation and Entrepreneurship”, Routledge Publishers
2. Abraham M.M, (2010), “Entrepreneurship Development and Project Management”, Prakash Publications and Printers.
3. 3. Desai, Vasant (2001), “Dynamics of entrepreneurial development and management”. Himalaya Publishing House.

Course Outcomes

1. Understand the definition and concept of entrepreneurship.
2. Understand objectives and need for training.
3. Understand meaning and features of project.
4. Understand government schemes and incentives for promotion of entrepreneurship
5. Understand export and import policies relevant to food processing sector;

MFT-451 Dissertation

Teaching Scheme	Examination Scheme
Credits: 20*	End Semester Exam: 300 Marks [Dissertation-100,Ppt-100,Viva-voce-100]

(*)Every student will be required to undertake a research project (**maximum tenure five months**) based on any of the areas related to food technology. The project report will be submitted in the form of dissertation duly certified by the supervisor of the dissertation by any research organization, industry, national institutes and/or Universities in India, by seeking the placement. The student then shall have to appear for the viva voce examination.

GUIDELINES FOR DISSERTATIONS REPORT LAYOUT

The report should contain the following components:

- **Title or Cover Page:** The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.
- **Acknowledgements** (optional): Acknowledgment to any advisory or financial assistance received in the course of work may be given.
- **Abstract:** It should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to objectives. The abstract have to be concise summary of the scope and results of the project.
- **Table of Contents:** Titles and subtitles are to correspond exactly with those in the text.
- **Introduction:** A brief introduction to the problem that is central to the project and it should aim to catch the imagination of the reader, so excessive details should be avoided.
- **Materials and Methods:** This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.
- **Results and Discussion:** Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.
- **Note** during writing, all figures & tables should as far as possible be next to the associated text, in same orientation as main text, numbered, & given appropriate titles.
- **Conclusion:** This is the final section in which outcome of the work is mentioned briefly.
- **Future prospects** (if applicable)
- **References / Bibliography:** This should include papers and books referred to in the body of thereport. These should be ordered alphabetically on the author's surname.
- **Appendices:** This contains material which is of interest to reader but not an integral part of the thesis and may be useful to document for future reference.

Course Outcomes

1. The student will be able to plan and execute experiments or undertake literature surveys independently.
2. The student will develop the skills to design experiments for solving problems in food research.