



# **SCHEME OF INSTRUCTION & SYLLABUS**

**FOR**

**MASTERS OF SCIENCE**

**IN**

**FOOD TECHNOLOGY**

*(w.e.f. Academic Session 2019)*

**Department of Food Technology**

**Invertis Institute of Applied Sciences & Humanities**

**INVERTIS UNIVERSITY, BAREILLY**

## Program Outcomes of M.Sc Food Technology

After completion of the program of M.Sc. in Food Technology, every student will know the following attributes

- PO1** Course imparts knowledge and understanding of Biology, Biochemistry, Food Chemistry, Food Microbiology, Food Science, Food processing, Food safety, Food Engineering, Food quality, Food product storage, Food product preservation, Food product packaging and Food product distribution.
- PO2** Provides sufficient understanding and cognitive abilities to design and develop technologies for food processing, preservation and packaging as per the legal and safety requirements.
- PO3** Imparts knowledge and training to develop carry out research, transferable skills and entrepreneurship abilities.
- PO4** To train students on use of various instrumentation for the evaluation of food quality and safety.
- PO5** To impart knowledge and understanding of technology of vegetables, fruits, meat, poultry, dairy and sea foods, bakery and confectionery to use it for further value addition and contribute towards food safety.
- PO6** To train students to conduct scientific experiments and document scientific investigations.
- PO7** Develops ability to extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data.

**SCHEME OF EVALUATION**  
**M.Sc. –FOOD TECHNOLOGY**  
**I-YEAR, SEMESTER-I**  
**(w.e.f. academic session 2019)**

S. No.	Course Code	SUBJECT	PERIODS			CREDIT	MARKS DISTRIBUTION		
			L	T	P		IAM	ESM	TOTAL
<b>THEORY</b>									
1	MFT-101	Principle of Food Processing	3	1	0	4	30	70	100
2	MFT-102	Food Chemistry	3	1	0	4	30	70	100
3	MFT-103	Instrumentation and Analytical Techniques	3	1	0	4	30	70	100
4	MFT-104	Principles of Food Engineering	3	1	0	4	30	70	100
5	MFT-105	Enzymes in Food Processing	3	1	0	4	30	70	100
<b>PRACTICAL / TRAINING / PROJECT / SEMINAR</b>									
5	MFT-151	Food Processing Lab	0	0	4	2	15	35	50
6	MFT-152	Food Chemistry Lab	0	0	4	2	15	35	50
7	MFT-153	Instrumentation Lab	0	0	4	2	15	35	50
8	MFT-155	Seminar I	0	0	0	2	50	0	50
<b>Total</b>			<b>15</b>	<b>5</b>	<b>12</b>	<b>28</b>	<b>245</b>	<b>455</b>	<b>700</b>
L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks									

**SCHEME OF EVALUATION**  
**M.Sc. – FOOD TECHNOLOGY**  
**I-YEAR, SEMESTER-II**  
**(w.e.f. academic session 2019)**

S. No.	Course Code	SUBJECT	PERIODS			CREDIT	MARKS DISTRIBUTION		
			L	T	P		IAM	ESM	TOTAL
<b>THEORY</b>									
1	MFT-201	Post Harvest Technology of Horticulture Crops	3	1	0	4	30	70	100
2	MFT-202	Food Microbiology	3	1	0	4	30	70	100
3	MFT-203	Packaging of Food Materials	3	1	0	4	30	70	100
4	MFT-204	Research Methodology, Biostatistics and Computer Applications	3	1	0	4	30	70	100
5	MFT-205	Technology of Meat and Poultry Products	3	1	0	4	30	70	100
<b>PRACTICAL / TRAINING / PROJECT / SEMINAR</b>									
6	MFT-251	Food Microbiology Lab	0	0	4	2	15	35	50
7	MFT-252	Meat and Poultry Products Lab	0	0	4	2	15	35	50
8	MFT-253	Food Engineering Lab	0	0	4	2	15	35	50
9	MFT-255	Seminar II	0	0	0	2	50	0	50
<b>Total</b>			<b>15</b>	<b>5</b>	<b>12</b>	<b>28</b>	<b>245</b>	<b>455</b>	<b>700</b>
L – Lecture; T – Tutorial; P – Practical; C – Credit; IAM – Internal Assessment Marks; ESM – End Semester Marks									

## MFT-101 Principles of Food Processing

<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hr/week	Class Test: 12Marks
Tutorials: 1	Teachers Assessment: 6
Credits: 4	Marks Attendance: 12 marks
	End Semester Exam: 70 Marks

### 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.

### Detailed Syllabus

<b>Module I</b>
Introduction: Definition and scope of Food Science and Technology, historical development of food processing and preservation, general principles of food preservation. Preservation by heating: Principles of the method, Types of microorganisms, bacterial load, sterilization and commercial sterility, thermal resistance of the microorganisms and enzymes.
<b>MODULE 2</b>
Canning and bottling: General aspects of canning and bottling, processing operations exhausting and sealing, retorting, ultra-high temperature processes, determination of thermal process time, processing equipments, canning/bottling of various food products. Refrigeration and freezing preservation: Refrigeration and storage of fresh foods, major requirements of a refrigeration plant, controlled atmospheric storage, refrigerated storage of various foods, freezing point of selected foods, influence of freezing and freezing rate of the quality of food products, methods of freezing, storage and thawing of frozen foods.
<b>MODULE 3</b>
Drying and dehydrations: Sun drying of various foods, water activity and its effect on the keeping quality, sorption isotherms and their use. Characteristics of food substances related to their dehydration behavior, drying phenomenon, factors affecting rate of drying, methods of drying of various food products, type of driers and their suitability for different foods; intermediate moisture foods.
<b>MODULE 4</b>
Concentration (Evaporation): Application in food industry, processes and equipment for manufacture of various concentrated foods and their keeping quality, Properties of liquid, single and multiple effect evaporation, Radiations: Sources of radiations, effect on microorganisms and different nutrients; Radiation Modules and doses for foods, dose requirements for radiation preservation of foods, safe limits, irradiation mechanism and survival curve, irradiation of packaging materials. Microwave Heating: Principles and application in food processing.
<b>MODULE5</b>
Chemical preservation: Preservation of foods by use of sugar, salt, chemicals and antibiotics and by smoking. Effect of various food processing operations on the nutrients of foods.

**TEXT / REFERENCE BOOKS**

1. Arsdel W.B., Copley, M.J. and Morgen, A.I. 1973. Food Dehydration, 2nd Edn. (2 vol. Set). AVI, Westport.
2. Bender, A.E. 1978. Food Processing and Nutrition. Academic Press, London.
3. Fellows, P. and Ellis H. 1990. Food Processing Technology: Principles and Practice, New York.
4. Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA.
5. Lewis, M.J. 1990. Physical Properties of Food and Food Processing Systems. Woodhead, UK.
6. Wildey, R.C. Ed. 1994. Minimally Processed Refrigerated Fruits and Vegetables. Chapman and Hall, London.

**Course Outcomes:**

After completing the course, students will be able to:

- |   |
|---|
| 1. Understand the historical development of food science and technology.        |
| 2. Understand the types of food processing methods.                             |
| 3. Understand about the different terminology related to food processing.       |
| 4. Understand the different types of preservation methods.                      |
| 5. Understand the basic principles, concepts and mechanism of food processings. |

## MFT-102 Food Chemistry

Teaching Scheme	Examination Scheme
Lectures: 3 hr./ week	Class Test: 12Marks
Tutorials: 1	Teachers Assessment: 6 Marks
Credits: 4	Attendance: 12 marks
	End Semester Exam: 70 Marks

### Course Objectives:

- 1.To give knowledge of various food molecules and their food chemistry.
- 2.To give knowledge about mechanism of reactions involved within food.
- 3.Gives knowledge of dietary requirements and nutritional value.
- 4.To impart knowledge on technology for food fortification.

### Detailed Syllabus

<b>MODULE 1</b>
Energy metabolism: Basal metabolic requirements and activity. Recommended Dietary allowances: Concept of a balanced diet, Menu planning. 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. Dietary requirements, Deficiency, Metabolic defects such as diabetes associated with carbohydrates. Modified starch.
<b>MODULE 2</b>
Browning reaction in foods: Enzymatic and non-enzymatic browning in foods of vegetable and animal origin during storage and processing of foods. Proteins: Classification, structure, properties, purification and denaturation of proteins. Protein interaction and degradation, protein-protein interaction, protein-lipid complexes and protein-carbohydrate complex. <u>Single cell proteins</u> Major protein systems and factors affecting them, the nature of interaction in proteins derived from milk. Egg proteins, meat proteins, fish muscle proteins, oil seed proteins and cereal proteins. Metabolic antagonist and allergens associated with food proteins. Concept of protein quality, dietary requirements, deficiency symptoms
<b>MODULE 3</b>
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, auto-oxidation, biological significance of auto-oxidation of lipids. Dietary requirements, effects of excess and deficiency: obesity, cardiovascular diseases. Metabolic antagonist and allergens associated with food proteins. Modified protein. Enzymes: Nature, classification and properties of food enzyme, enzyme activity in different food systems, commercial availability. Food enzyme technology. Immobilization of enzymes, removal of toxicants through enzymes, flavor production by enzymes.
<b>MODULE 4</b>
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.
<b>MODULE 5</b>
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

**Text/ References Books:**

1. Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
2. Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science, 3rd Ed. Pergamon Press, New York.
3. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
4. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
5. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport.
6. Belitz HD.1999. Food Chemistry. Springer Verlag.
7. DeMan JM. 1976. Principles of Food Chemistry. AVI.
8. Fennema OR.1996. Food Chemistry. Marcel Dekker.
9. Meyer LH. 1987. Food Chemistry. CBS

**Course Outcomes:**

After completing the course, students will be able to:

1. Understand the different types energy metabolism.
2. Understand the steps of various food reactions.
3. Understand about the different molecules present in food, their structure and function.
4. Understand the different diseases related to over nutrition.
5. Understand the basic of technologies like immobilization and food fortification.



## MFT-103 Instrumentation and Analytical Techniques

<b>Teaching Scheme</b> Lectures: 3 hr./ week Tutorials: 1 Credits: 4	<b>Examination Scheme</b> Class Test: 12 Marks Teachers Assessment: 6 Marks Attendance: 12 marks End Semester Exam: 70 Marks
---	--

### Course Objectives:

1. To give knowledge of various process variables in food processing.
2. To give knowledge about principles and equipments related to various food technologies.
3. Gives knowledge of various chromatographic techniques.
4. To impart knowledge on technology various sensor based system in food technology.

### Detailed Syllabus

<b>MODULE I</b> <b>Process variables in food processing industries:</b> Canned and bottled fruits and vegetables, Beer, Ciders, Soft drinks, Sugar, Jams and Jellies, Black tea. <b>Classification of transducers:</b> Definitions, active and passive transducers, resistive, capacitive, inductive, magnetic, optical, hall sensors. <b>Moisture measurements:</b> Role of moisture in food, weigh and dry method, microwave absorption method, RF, IR, DC resistance technique, moisture release measurement. <b>Humidity measurement:</b> Role in food processing, types, wet and dry bulb hygrometer, Electronic methods. <b>Turbidity and colour:</b> Role, standards and Modules, basic turbidity meter, light scattering type, absorption type, reflectance type colour measurement, digital image processing method.
<b>MODULE II</b> <b>Food flow and viscosity:</b> Magnetic flow meter, flow meter, man flow meter, turbine flow meter, gravimetric feeder meter, definition of viscosity, Newtonian and non-Newtonian flow, various types of viscometers. <b>Brix and pH:</b> Brix standard, refractometer, pH scale, role of brix and pH in food. pH electrode.
<b>MODULE III</b> <b>Food enzymes and flavour:</b> Importance of enzyme sensors, biosensors, human olfaction, Electronics Nose. Controllers and indicators: Basic control concept, Temperature controller in dryer, ration control in food pickling, atmospheric controller in food preservation, timers and indicators. Practicals Experiments on transducers such as Load Cell, Thermocouple, RPM Sensors, IC Sensor, LVDT, Optical sensor, E-Nose etc.
<b>Module IV</b> <b>Chromatography Techniques:</b> TLC and Paper chromatography; Chromatographic methods for macromolecule separation - Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity. <b>Electrophoretic techniques:</b> Theory and application of Polyacrylamide and Agarose gel electrophoresis; Capillary electrophoresis; 2D Electrophoresis; Disc gel electrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis
<b>Module V</b> <b>Centrifugation:</b> Basic principles; Mathematics & theory (RCF, Sedimentation coefficient etc); Types of centrifuge - Microcentrifuge, High speed & Ultracentrifuges; Preparative centrifugation; Differential & density gradient centrifugation; Determination of molecular weight by sedimentation velocity methods. <b>Microscopic Techniques:</b> Simple, compound, inverted, stereo, fluorescence, phase contrast microscopy. Dark field and bright field microscope. <b>Electron microscopy:</b> Transmission Electron Microscope and Scanning Electron Microscope, Basic concept of confocal microscope.

**Text/References:**

1. M. Bhuyan , "Measurement and Control in Food Processing", CRC Press (1st ed), 2007.
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:

1. Understand the different types of process variables involved in food processing techniques.
2. Understand the principles of food rheology.
3. Understand about the different transducers and sensor based systems.
4. Understand the different chromatographic techniques.

## MFT-104 Principles of Food Engineering

Teaching Scheme	Examination Scheme
Lectures: 3hr./ week	Class Test: 12Marks
Tutorials: 1	Teachers Assessment: 6 Marks
Credits: 4	Attendance: 12 marks
	End Semester Exam: 70 Marks

### Course Objectives:

- 1.To give knowledge of concepts related to mass and energy balances.
- 2.To give knowledge about principles and equipments for many unit operations in food technology.
- 3.Gives knowledge of various membrane technologies.
- 4.To impart knowledge on engineering concepts related to various food processing techniques.

### Detailed Syllabus

<b>MODULE 1</b>
Mass and energy balance Heat transfer: Steam injection, steam infusion, plate heat exchangers, tubular heat exchangers and scraped surface heat exchangers.
<b>MODULE 2</b>
Size reduction process: Principles, theories and laws, energy considerations, equipments. Mixing and forming, theory and applications, mixing indices, equipments for solid and liquid. Fluid flow, laminar, turbulent and transitional ranges, velocity distribution profiles, basic equations, thermal velocity calculations.
<b>MODULE 3</b>
Pasteurization: Theory and application, pasteurization of packaged and unpacked foods, pasteurization calculations, equipments. Thermal processing: Death kinetics, thermal death curve, decimal reduction time. Z-factor, heat penetration curve, process time calculations, mathematical curve, process time calculations. Mathematical and graphical solutions.
<b>MODULE 4</b>
Evaporation: heat and mass balance, steam economy, heat recovery, efficiency, process calculations, Food dehydration: constant and falling rate periods, drying rate calculations. Chilling, refrigeration and freezing: theories, characteristics curve, cooling rate calculations. Separation processes: Filtration and centrifugation, theories and mathematical descriptions, constant rate and constant pressure filtration, equipment. Extrusion: Theory and applications, extrusion cookers and cold extrusion, single and twin screw extruders, design considerations.
<b>MODULE 5</b>
Membrane Technology- Reverse osmosis and Ultra filtration, Micro filtration-Supercritical gas extraction Advances in fortification: Synthetic nutrients. Techniques of food fortification. Stability of nutrients in relation to processing. Encapsulations: design and structure of microcapsules, release rate and mechanism. Techniques of micro encapsulation, advantages and application of encapsulation. Non thermal Processing: High pressure processing, Pulsed electric processing, Ohmic heating.
<b>Reference books / text books:</b>
1. Batty, J.C. and Folkman, S.L. 1983. Food Engineering Fundamentals. John wiley and Sons, New York.
2. Fennema O.R. Ed. 1985, Principles of Food Science: Part-II Physical Principles of food Preservation. Marcel Dekker, New York.
3. Harper, J.C. 1975. Elements of Food Engineering. AVI, Westport.
4. Heldman, D.R. and Lund, D.B. Ed. 1992. Hand book of Food Engineering marcel Dekker, New York.
5. "Non-Thermal Preservation of Foods," G.V. Barbosa-Canovas, U.R. Pothakumary, E. Palou, B.G. Swanson, Marcel Dekker, New York, 1998

**Course Outcomes:**

After completing the course, students will be able to:

1. Understand the different concepts of food engineering.
2. Understand the types of equipments and their working.
3. Engineering behind many food processing operations.
4. Heat and mass balance concept implementation.
5. Understand the novel technologies like extrusion and membrane technology.

## MFT-105 Enzymes in Food Processing

Teaching Scheme	Examination Scheme
Lectures: 3 hr./ week Tutorials: 1 Credits: 4	Class Test: 12Marks Teachers Assessment: 6 Marks Attendance: 12 marks End Semester Exam: 70 Marks

### Course Objectives:

- 1.To give knowledge of enzymes molecules,their properties,kinetics and immobilization.
- 2.To give knowledge about use of enzymes as processing aids.
- 3.Gives knowledge of various enzyme technologies and their effect of food molecules modification.
- 4.Gives knowledge of food flavour production by enzymes.

### Detailed Syllabus

<b>MODULE 1</b>
Enzymes classification, properties, characterization, kinetics and immobilization; fermentative production of enzymes (amylases, proteases, cellulases, pectinases, xylanases, lipases) used in food industry and their downstream processing.
<b>MODULE 2</b>
Enzymes for starch modification (maltodextrins and corn syrup solids:liquefaction, saccharification, dextrinization, isomerization for production of high-fructose-corn-syrup, fructose and fructo-oligosaccharides). Enzymes for protein modification (hydrolysates and bioactive peptides), Enzymes for Lipid modification.
<b>MODULE 3</b>
Enzymes as processing aids: Role of enzymes in Dairy processing (cheese making and whey processing). Role of enzymes in meat processing (tenderization and flavour development) and fish processing (De-skinning, collagen extraction etc..) Egg processing.
<b>MODULE 4</b>
Role of enzymes in Brewing, Baking (fungal -amylase for bread making; maltogenic -amylases for anti-staling, xylanases and pentosanases as dough conditioners; lipases or dough conditioning; oxidases as replacers of chemical oxidants, synergistic effect of enzymes).
<b>MODULE 5</b>
Role of enzymes in the production of flavours (enzyme-aided extraction of plant materials for production of flavours, production of flavour enhancers such as nucleotides, MSG; flavours from hydrolyzed vegetable/animal protein)
<b>Text books and References</b>
1. Whitehurst,R.J. & Van-Oort,M., (2010), Enzymes in Food technology, Second edition, Blackwell Publishing Ltd
2. Aehle, W. (2007) Enzymes in Industry: Production and application. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim
3. Rastall,R (2007) Novel enzyme technology for food applications Woodhead Publishing Limited, Abington Hall, Abington, Cambridge CB21 6AH, England
4. Kalaichelvan, P.T., (2002), Bio process technology, MJP publishers, Chennai
5. Enzymes in Food Processing by Tilak Nagodainthana and Gerald Reed.
6. Enzymes in Food Processing by G.A.Tucker and LFJ Woods.

### Course Outcomes:

After completing the course, students will be able to:

1. Understand the molecules of food enzymes and their uses.
2. Understand the modification techniques of enzymes.

3. Understand the role of enzymes in various food processing operations.

4. Understand the enzymes use in food flavor production.

5. Understand the basic concept of enzyme immobilization.

### MFT-151 Food Processing Lab

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10
Credits: 2	Record: 05 Marks
	End Semester Marks:35

#### Course Objectives:

- 1.To give practical knowledge of food proximate analysis.
- 2.Provides practical knowledge of various testing equipments.
- 3.Gives knowledge of various standard solutions preparation and their principles.

#### Detailed Syllabus

1. Preparation of standard solutions for the chemical analysis i.e. HCl, H<sub>2</sub>SO<sub>4</sub>, KmnO<sub>4</sub>, Sodium Thiosulphate and Iodine.
2. Determination of pH and acidity of foods
3. Determination of proximate composition of Foods
  - a) Moisture,
  - b) Protein,
  - c) Fat,
  - d) Total ash,
  - e) Crude fibre
  - f) Carbohydrate
  - g) Calorific Value
4. Determination of minerals in food products
  - a) Calcium by Titration
  - b) Phosphorus by Spectrophotometer
  - c) Iron by Spectrophotometer
5. Estimation of reducing, non-reducing, total sugars in cereals and fruits & vegetable products.
6. Determination of starch content in food products.
7. Determination of trypsin inhibitors.

#### Course Outcomes:

After completing the course, students will be able to:

1. Understand the different concepts of titration and food analysis.
2. Understand the working of various food testing equipments.
3. Understand about basic principles of food analysis.

## MFT-152 Food Chemistry Lab

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10
Credits: 2	Record: 05 Marks
	End Semester Marks:35

### Course Objectives:

- 1.To give practical knowledge of food chemistry.
- 2.Provides practical knowledge of various food analysis methods.
- 3.Gives knowledge of use of many equipments..

### Detailed Syllabus

1. Estimation of fats & Oils
  - a) Free fatty acid
  - b) Peroxide value
  - c) Saponification value
  - d) RM Number
  - e) TBA test
  - f) Iodine value
  - g) Fat adulteration test
2. Determination of NaCl content in food products.
3. Determination of trypsin inhibitors
4. Qualitative analysis of compounds by chromatography techniques
  - a) Thin layer Chromatography
  - b) Paper Chromatography: Descending, Ascending and Circular Paper chromatography.
  - c) By using High Performance Liquid Chromatography.
  - d) Column chromatography: Separation of beta carotene
5. Use of electrophoresis in the determination of proteins.
6. Determination of Rheological properties by using texture analyzer.

### Course Outcomes:

After completing the course, students will be able to:

1. Understand the different concepts behind food analysis.
2. Understand the basics of food chromatography.
3. Understand about the different terminology related to food analysis.
4. Understand the working of food analysis equipments.



### MFT-153 Instrumentation Lab

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10
Credits: 2	Record: 05 Marks
	End Semester Marks:35

#### 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

1. Moisture measurement in different food products.
2. Determination of pH effect on food products.
3. Preparation of buffers for protein isolation.
4. Qualitative and quantitative estimation of proteins by spectrophotometer.
5. Spectrophotometric estimation carbohydrate.
6. Determination of molecular weight of protein sample by SDS-PAGE.
7. Characterization of protein samples by coomassie brilliant blue and silver staining
8. Analysis of affinity difference by paper chromatography.
9. Estimation of fat, protein, vitamins in given food samples.

#### Course Outcomes:

After completing the course, students will be able to:

1. Understand the different instrumentation for food analysis.
2. Understand the basics of food chromatography.
3. Understand about the different terminology related to food analysis.
4. Understand the working of electrophoresis method.

### MFT-155 Seminar

Teaching Scheme	Examination Scheme
Lectures: Nil Tutorials: Nil Credits: 2	Internal Assessment: 50 Marks

#### Course Objectives:

To prepare 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.

#### Detailed Syllabus

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

## MFT-201 Post Harvest Technology of Horticultural Crops

Teaching Scheme	Examination Scheme
Lectures: 3 hr./ week	Class Test: 12 Marks
Tutorials: 1	Teachers Assessment: 6 Marks
Credits: 4	Attendance: 12 Marks
	End Semester Exam: 70 Marks

### Course Objectives:

- 1.To give knowledge of chemical composition of fruits and vegetables ,their pre and post harvest changes.
- 2.To give knowledge about storage of fruits and vegetables and cause of their post harvest losses.
- 3.Gives knowledge of methods to prevent the post harvest losses.
- 4.To impart knowledge on technology for food preservation techniques.

### Detailed Syllabus

<b>MODULE 1</b>
Fruits and vegetables as living products: Chemical composition; pre and post harvest changes, maturity standards for storage, desirable characteristics of fruits and vegetables of processing. Post harvest handling of fresh fruits and vegetables: Role of plants growth regulators in relation to storage; physical and chemical treatment to increase the shelf-life, conditions for transportation and storage, disease and injuries during marketing.
<b>MODULE 2</b>
Storage of fresh fruits and vegetables. Containers: Tin, glass and other packaging materials used in fruits and vegetables preservations. Canning and bottling: quality of raw materials, preparation of materials, preparation of syrups and brines, canning and bottling, effect of canning and bottling on nutritive value, spoilage of canned foods, detection and control.
<b>MODULE 3</b>
Fruit and vegetable juices: Preparation of juice, syrups, squashes, cordials, and nectars; concentrations and drying of juice, packaging and storage and concentrations and powders; fortified and soft drinks. Preparation of preserve and candied fruits.
<b>MODULE 4</b>
Preservation by freezing, general methods for freezing of fruits and vegetables; problem relating to storage of frozen products; standards for frozen food products. Dehydration of fruits and vegetables: Methods; packaging, storage, quality control during and after dehydration. Pickles and chutneys: Preparation of various types of pickles-theory and practice; preparation of sauces and chutneys; problems relating to the shelf life of pickles and chutneys; quality control.
<b>MODULE 5</b>
Tomato products: preparation of various tomato products, food standards and quality control. Pectin: Raw materials; processes and uses of pectin; products based on pectin manufacture and quality control. Food additives: Use in fruit and vegetable preservation. Vinegar: General methods of preparation, food standards and quality control. Uses and Utilization of waste from fruit and vegetables processing plant.

**BOOKS FOR REFERENCE :**

1. Haard, N.F. and Salunkhe, D.K. 1975. Postharvest Biology and Handling of Fruits and Vegetables. AVI, Westport.
2. Kader, A. A. 1992. Postharvest Technology of Horticultural Crops, 2nd Ed. University of California, Division of Agriculture and National Resources, California.
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. 1989. Postharvest: An Introduction to the Physiology and Handling of Fruits and Vegetables. BSP Professional Books, Oxford.
5. Preservation of Fruits and Vegetables–Girdhari Lal, Siddhapa and Tondon, ICAR, New Delhi.
6. Hand Book of Analysis and Quality Control of Fruits & Vegetable Products–S. Ranganna Tata McGraw Hill, New Delhi.
7. Thompson AK. 1995. Post Harvest Technology of Fruits and Vegetables. Blackwell Sci.

**Course Outcomes**

After completing the course, students will be able to:

1. Understand the different causes of post harvest losses.
2. Gives knowledge about canning and bottling of fruit and vegetables.
3. Imparts knowledge of food preservation methods to prevent post harvest losses.
4. Understand the various food standards and quality control for food preservation.

## MFT-202 Food Microbiology

<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hr./ week Tutorials: 1 Credits: 4	Class Test: 12 Marks Teachers Assessment: 6 Marks Attendance: 12 Marks End Semester Exam: 70 Marks

### **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 methods to for fermented food preparations.
- 4.To impart knowledge about pathogens, their investigation and role of biotechnology in food microbiology.

### **Detailed Syllabus**

<b>MODULE 1</b>
General characteristics of microorganisms: Classification and identification of yeasts, molds and groups of bacteria important in food industry. Source of contamination: Air, water, soil, sewage, post processing contamination.
<b>MODULE 2</b>
Intrinsic and extrinsic factors influencing growth of microorganisms in foods. Classification of foods and general principles involved in their preservation: Effects on microbes of: Low temperature preservation, lethal effects of chilling, freezing and thawing; high temperature preservation. Heat resistance of microorganism, heat penetration and thermal processing. Pasteurization, sterilization, canning and dehydration; chemical preservation and its toxic effects; irradiations.
<b>MODULE 3</b>
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.
<b>MODULE 4</b>
Microbiology of fermentation: Fermented milks. Cereal foods, vinegar, oriental foods, alcoholic beverages. Therapeutic value of fermented foods. Food spoilage: Spoilage of fresh and processed fruit and vegetables, spoilage of meat, fish, eggs and poultry products. Microbial toxins.
<b>MODULE 5</b>
Pathogens in foods: Microbial infections and intoxications. Growth and survival of pathogens in food. Food borne diseases. Investigation and control Food Biotechnology: Use of biotechnologically improved enzymes in food processing industry.

### **BOOKS FOR REFERENCE**

1. Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, New York.
2. Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.
3. Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.
4. Microbiology by Pelczar, Smith & Chan.
5. Food Microbiology by Frazier
6. Introduction to Microbiology by Stainier.
7. Food microbiology by V. Ramesh, MJP publishing.2007

### **Course Outcomes:**

After completing the course, students will be able to:

1. Understand the different types of microorganisms and their structure.
2. Understand the effect of various processing on food microbes.
3. Understand about the different types of fermented foods and their production technologies..
4. Understand the different food spoilage causes.
5. Understand the microbiology of fermentation and biotechnological improved enzymes uses.

<b>MFT-203 Packaging of Food Materials</b>	
<b>Teaching Scheme</b> Lectures: 3 hr./ week Tutorials: 1 Credits: 4	<b>Examination Scheme</b> Class Test: 12 Marks Teachers Assessment: 6 Marks Attendance: 12 Marks End Semester Exam: 70 Marks

**Course Objectives:**

- 1.To give knowledge of definitions and functions of packaging.
- 2.To give knowledge about properties of packaging materials, metal cans and prediction of shelf life of various packaged food products.
- 3.To impart knowledge of methods of packaging like modified atmospheric packaging, intelligent packaging and their quality control.
- 4.To impart knowledge about package sterilization techniques.

**Detailed Syllabus**

<b>MODULE I</b>
Definitions and functions of packaging and packaging materials. Packaging requirements and selection of packaging materials; Types of packaging materials: paper: pulping, fibrillation and beating, types of paper and their testing methods; Glass: composition, properties, methods of making bottles and jars; Metals: Tin plate containers, tinning process, components of tin plate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, coextrusion, edible films and biodegradable plastics.
<b>MODULE 2</b>
Properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation; Barrier properties of packaging materials: Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and its measurement, prediction of shelf life of foods.
<b>MODULE 3</b>
Different packaging systems for dehydrated foods, frozen foods, dairy foods, fresh fruits and vegetables, meat, poultry and sea foods. Process of Packaging: Material handling, filling, air removal, sealing, retorting, Modified atmosphere packaging, vacuum and gas packaging. Package sterilization techniques, cushioning, modelling, palletizing, stacking and containerization.
<b>MODULE 4</b>
Quality Control: Evaluation of Packaging materials, toxicity, corrosion prevention, shelf life testing, minimization of transport losses, Hazards in handling and storage and packaging and their minimization.
<b>MODULE 5</b>
Packaging Laws and Regulations, Standards of Weights and Measures Act, Advancement in packaging Technology: Smart packaging, Active packaging, Anti-microbial packaging etc.

**BOOKS FOR REFERENCE**

1. Painy, F.A. and Painy, H.Y. 1983. A Handbook of Food Packaging. Leonard Hill, Glasgow, UK.
2. Scicharow, S. and Griffin, R.C. 1970. Food Packaging. AVI, Westport.
3. Food Packaging Principles by Gordon Robertson, 2005.
4. Food Packaging by Takashi Kadoya, 1990.
5. Foods & Packaging Materials Chemical Interactions by Paul Acherman
6. S. K. Sharma, S.J.Mulvaney, and S.S.H.Rizvi, Food Process Engineering: Theory and Laboratory Experiments, Wiley and Sons, 2000
7. H. Pandey, H.K. Sharma, R.C.Chouhan, B.C. Sarkar and M.C. Bera, Experiments in Food Process Engineering, CBS Publishers and Distributors, 2004
8. 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:

1. Understand the functions of packaging ,types of packaging materials and their properties.
2. Understand the features of various packaging systems for all type of foods.
3. Quality control and evaluation methods of packaging materials and their barrier properties.
4. Understand the modified,gas,vacuum ,smart,active,antimicrobial and intelligent packaging techniques and process.
5. Gain knowledge about packaging laws and regulations.



**MFT204: RESEARCH METHODOLOGY, BIO-STATISTICS AND COMPUTER APPLICATIONS****Teaching Scheme**

Lectures: 3hr./ week

Tutorials: 1

Credits:4

**Examination Scheme**

Class Test: 12 Marks

Teachers Assessment: 6 Marks

Attendance: 12 Marks

End Semester Exam: 70 Marks

**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 in food technology,application softwares and database management systems.

**Detailed Syllabus****MODULE I**

Scientific Approach to Research: Meaning, significance, types of research studies. Research Process: Formulating the problem, objectives, hypothesis, Experimental design, sample design, collecting data, analysis of data, interpretation, preparation of report.

**MODULE 2**

Sampling design: Census vs. sample survey. Steps, types. Scaling techniques: Continuum, Reliability, Validity, Scale construction techniques. Experimental designs: Randomized Block design Processing of data: Development of code book.

**MODULE 3**

Measurements: Nature of measurements, types of measurement scale, Frequency distribution, graphical presentation of data. Measures of Central Tendency: Computation of mean, median and mode, their uses.

**MODULE 4**

Measures of variability: Computation of mean deviations, Quartile deviation and standard deviation, their uses. Correlation: Regression, Meaning, Spearman and Pearson's techniques of correlation, Linear regression Chi Square: Tests of significance of difference between means: t-test. Analysis of Variance (ANOVA): One way and two ways. Applications to food quality assessments

**MODULE 5**

Introduction of computer science in food technology, computer and its role, parts of computer; Hardware and Software, windows, number systems and conversion method, Application software, word processors, spreadsheets, Database management systems, presentation graphics, integrated packages, management of biological data by office applications: MS-office, MS-Word, MS-Excel, and MS-PowerPoint. Use of computers for: preparing and presenting documents, spreadsheets, appropriate statistical and other relevant packages, Internet. Computer applications in Food Technology- Response Surface Methodology

**TEXT / REFERENCE BOOKS:**

1. Bandarkar, P.L. and Wilkinson T.S. (2000): Methodology and Techniques of Social Research, Himalaya Publishing House, Mumbai.
2. Copper, H.M. (2002). Intergrating research : A guide for literature reviews (2nd Edition). California: Sage
3. Harman, E & Montages, I. (Eds.) (2007). The thesis and the book, New Delhi: Vistar.
4. Mukherjee, R. (1989): The Quality of Life: Valuation in School Research, Sage Publications, New Delhi.
5. Strass, A and Corbin, J. (1990): Basis of Qualitative Research: Grounded Theory Procedures and Techniques, Sage Publications, California.
6. Introduction to Information Technology, Pearson Education, New Delhi.
7. Norton, peter, Introduction to Computers, Tata McGraw Hill, New Delhi.
8. Douglas, Comer E., Computer Networks and Internet, Pearsons Education, New Delhi.

**Course Outcomes:**

After completing the course, students will be able to:

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. Understand the management of biological data by office applications: MS Office
6. Computer applications in food technology like response surface methodology.

## MFT205: TECHNOLOGY OF MEAT AND POULTRY PRODUCTS

Teaching Scheme	Examination Scheme
Lectures: 3hr./ week Tutorials: 1 Credits: 4	Class Test: 12 Marks Teachers Assessment: 6 Marks Attendance: 12 Marks End Semester Exam: 70 Marks

### 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

<b>MODULE 1</b>
Scope of meat & meat products industry in India. Structure of meat tissue. Chemical composition and nutritive value of meat.
<b>MODULE 2</b>
Mechanism of muscle contraction and relaxation. Effect of processing parameters on product constituents, viz. lipid, protein, carbohydrates and flavor,Postmortem changes-factor affecting postmortem changes, thaw rigor and cold shortening. Composition and chemistry of chicken muscle, pre and post slaughter factors affecting poultry meat quality. Properties of fresh meat.
<b>MODULE 3</b>
Preservation of meat & poultry- chilling, freezing, curing, smoking, canning, dehydration, irradiation, freeze drying, antibiotics, microwave, chemicals Meat carcass grading and cuts. Restructured meat products. Pre-rigor processing of meat. Meat tenderization and its techniques. ; packaging and grading of poultry meat.
<b>MODULE 4</b>
Utilization of meat industry by-products. Eggs - structure, composition, nutritive value and functional properties of eggs. Internal quality of eggs- evaluation, quality troubleshooters in eggs, egg grading. Preservation and maintenance of internal quality of eggs, . Microbial spoilage of egg and egg; products. Preparation of meat, fish and poultry products.
<b>MODULE 5</b>
Egg products-Egg powders, frozen eggs, egg foams, factors influencing foaming. Industrial uses of eggs. Collection, grading, cleaning, washing, packaging and transportation of eggs, preparation of egg products.Poultry -types, factors affecting quality, chemical composition and nutritive value of poultry meat,Poultry dressing-ante and postmortem examination, methods of stunning, slaughter, scalding& dressing. Tenderness of poultry, problem factors in poultry meat. Utilization of poultry industry by-products.

**Reference books / text books:**

- |  |
|--|
| 1. Legarreta,I.G. (2010). Handbook of Poultry Science and Technology (Volume I and Volume II), John Wiley & Sons, Inc., Hoboken, New Jersey. U.S |
| 2. Sam, A.R (2001) Poultry meat processing CRC Press Taylor & Francis Group  |
| 3. Hui YH. (2001). Meat Science and Applications. Marcel Dekker.   |
| 4. Kerry, J. (2002). Meat Processing. Woodhead Publ. CRC Press.  |
| 5. Levie A. (2002). Meat Hand Book. 4th Ed. AVI Publ.  |
| 6. Mead M. 2004. Poultry Meat Processing and Quality. Woodhead Publ.   |
| 7. Pearson, A.M. & Gillett, T.A. 2006. Processed Meat. 3rd Ed. Chapman & Hall.   |
| 8. Lawrie, R.A. 2006. Meat Science 7th Edn. Woodhead publishers .UK.   |
| 9. Govindan TK. 1985. Fish Processing Technology. Oxford & IBH.  |
| 10. Hui YH. 2001. Meat Science and Applications. Marcel Dekker. 32   |
| 11. Kerry J. et al. 2002. Meat Processing. Woodhead Publ. CRC Press.   |
| 12. Pearson AM & Gillett TA. 1996. Processed Meat. 3rd Ed. Chapman & Hall.   |

**Course Outcomes:**

After completing the course, students will be able to:

- |  |
|--|
| 1. Understand about current scenario of meat and poultry industry in India.  |
| 2. Understand the various scientific changes that occurs after meat and poultry slaughtering.                                |
| 3. Understand about the different terminology related to meat and poultry processing and its grading.                        |
| 4. Understand the egg ,egg products and industrial uses of eggs.   |
| 5. Understand the basic principles of meat,poultry and egg preservation techniques.  |
| 6. Understand by product utilization of meat,poultry and fish processing industry along with the restructured meat products. |

### MFT-251 Food Microbiology Lab

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10
Credits: 2	Record: 05 Marks
	End Semester Marks:35

#### Course Objectives:

- 1.To give practical knowledge about determination of microbial quality assessment of food.
- 2.To attain expertise in analysis of canned food product microbial and chemical spoilage.

#### Detailed Syllabus

1. Determination of microbial counts:
  - a. Total viable,
  - b. thermophilic,
  - c. proteolytic,
  - d. lipolytic
  - e. aerobic spore farmers,
  - f. coliform counts,
  - g. yeast & mold count.
2. Determination of activity of starter cultures used and dairy industry.
3. Dye reduction test.
4. Determination of thermal resistance of enzymes and microorganisms
5. Analysis of canned food products for chemical and microbiological spoilage.

#### Course Outcomes:

After completing the course, students will be able to:

1. Understand the different methods of microbial assessment of food quality and safety as well.
2. Understand the techniques to be employed in determining the activity of various starter cultures used in dairy industry.

## MFT-252 MEAT AND POULTRY PRODUCTS LAB

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10
Credits: 2	Record: 05 Marks
	End Semester Marks:35

### Course Objectives:

- 1.To give practical knowledge about determination of egg quality assessment,its composition.
- 2.To attain expertise in slaughtering and dressing methods of poultry with knowledge of their various retail cuts.

### Detailed Syllabus

1. Determination of Internal quality of eggs.
2. Determination of % of different components of egg.
3. Determination of egg constituents such as ash, total solids and moisture.
4. Preservation of internal quality of eggs by different methods.
5. To study slaughtering and dressing of poultry bird.
6. To make retail cuts of dressed chicken and calculating % yields.

### Course Outcomes:

After completing the course, students will be able to:

1. Understand the various methods of assessment of egg quality,its composition,constituents and its preservation also.
2. Understand slaughtering and dressing methods of poultry with knowledge of their various retail cuts.

### MFT-253 FOOD ENGINEERING LAB

Teaching Scheme	Examination Scheme
Lectures: Nil	Internal Assessment: 15 Marks
Tutorials: Nil	Practical: 20 marks
Practicals:4	Viva:10 marks
Credits: 2	Record: 05 Marks
	End Semester Marks:35

#### Course Objectives:

- 1.To give practical knowledge about analysis of canned food products for chemical and microbiological spoilage.
- 2.To attain expertise in analysis of vitamin C,lycopene,tannins,saponins,pectin in food.
- 3.To understand the methods of preparation of dehydrated fruits and vegetables, their value addition by preparing ketchup,sauces,jam,jelly,marmalade,squash and cordials from them.
4. Determination method for chemical preservatives and use of flame photometry for Na and K in food.

#### Detailed Syllabus

1. Analysis of canned food products for chemical and microbiological spoilage
  2. Tin coating test
    - a) Tin coating weight measurement (Clarke's Test)
    - b) Determination of the continuity of tin coating
    - c) Sulphide stain test and corrosion resistance test
  3. Determination of Ascorbic acid content in food products.
  4. Determination of lycopene content
  5. Determination of tannins and saponins in food products.
  6. Dehydration of fruits and vegetables
  7. Preparation of tomato products like ketchup, puree & past
  8. Preparation of Jam, Jelly, marmalade, preserve and fruit candy
  9. Pectin determination in fruits and vegetable products.
  10. Determination of chemical preservatives in fruits and vegetables products.
  11. Preparation and analysis of fruits beverages i.e. Squash and cordial.
  12. Use of flame photometry in the estimation of trace metals like Sodium and Potassium

#### Course Outcomes:

After completing the course, students will be able to:

1. Understand about analysis of canned food products
2. Understand the analysis methods of vitamin C,pectin,saponins,lycopene and tannins.
3. Understand methods of preparation of dehydrated fruits and vegetables, their value addition by preparing ketchup,sauces,jam,jelly,marmalade,squash and cordials
4. Understand the method of analyzing chemical preservatives in use and use of flame photometry for Na and K in food.

### MFT-254 SEMINAR

Teaching Scheme	Examination Scheme
Lectures: Nil Tutorials: Nil Practicals: Nil Credits: 2	Internal Assessment: 50 marks

#### Course Objectives:

To prepare 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.