M. Tech in Food Technology (Food Process Engineering)

**Basic Supporting Courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1. COMP 805</td>
<td>Computer Programming</td>
<td>2</td>
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<tr>
<td>2. MAS 713</td>
<td>Advanced Engg. Statistics</td>
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<tr>
<td>3. APFE 705</td>
<td>Optimization Techniques in Food Technology</td>
<td>3</td>
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<td>4. CHEM 717</td>
<td>Advanced Food Chemistry</td>
<td>2</td>
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**Core Courses:**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. APFE 706</td>
<td>International Food Legislations &amp; Standards</td>
<td>2</td>
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<td>2. APFE 707</td>
<td>Food Quality Control</td>
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<td>3. APFE 708</td>
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<td>4. APFE 802</td>
<td>Modern Fruits &amp; Vegetables Processing Techniques</td>
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<td>5. APFE 803</td>
<td>Advanced Food Packaging</td>
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<td>6. APFE 811</td>
<td>Advanced Beverage Technology</td>
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<td>7. APFE 823</td>
<td>Modern Baking &amp; Confectionary Technology</td>
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<td>8. DT 820</td>
<td>Processing of Milk &amp; Milk Products</td>
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<td>9. MBMT811</td>
<td>Food Microbiology</td>
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**Specialized Courses:**

**Food Processing Engineering:**

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<tr>
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<tbody>
<tr>
<td>APFE 801</td>
<td>Advanced Food Process Equipment Design</td>
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<td>APFE 810</td>
<td>Food Plant Design</td>
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<td>APFE 812</td>
<td>Entrepreneurship Development in Food Processing</td>
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<td>APFE 815</td>
<td>Thermal &amp; Non-Thermal Processing</td>
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<tr>
<td>APFE 816</td>
<td>Food Biosensors</td>
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<td>APFE 817</td>
<td>Food Process Modeling</td>
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<tr>
<td>APFE 818</td>
<td>Food Fermentation Technology</td>
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<tr>
<td>APFE 821</td>
<td>Functional Foods</td>
<td>3</td>
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<tr>
<td>APFE 824</td>
<td>Food Safety Analysis</td>
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Basic Supporting Courses:

**COMP 805  Computer Programming**  
3(2-0-1)  

**MAS 713  Advanced Engineering Statistics**  
3(3-0-0)  
Sample size, data collection, design of experiments, LSD, RBD, split plot design, factorial design, CRD, CCRD, testing of hypothesis, Analysis of variance, t-test, z-test, f-test, $X^2$-test.

**APFE 705 Optimization Techniques in Food Technology**  
3 (3-0-0)  
Principles of modelling; Linear programming-concepts, graphical and algebraic solution; Simplex method; Duality theory; Post-optimality analysis; Sensitivity analysis; Transportation and assignment models; Computer applications to LP, queuing theory; Project scheduling and management by PERT-CPM; Integer programming; Non-linear programming; Simulation; Goal programming; Decision theory; Markov chains; Sequencing problem.

**CHEM 717  Advanced Food Chemistry**  
3(2-0-1)  
Vegetables and fruit: Classification, general composition, chemical changes during ripening and storage. Jams, jellies and pickles: Classification, composition, and preservation. Beverages: Classification, coffee, tea, and cocoa-gradation, composition, chemical changes during processing, volatile compounds. Preservation of foods: General principles of food preservation, chemical preservation, preservation through irradiation.

Core Courses

**APFE 706 International food Legislation & Standards**
2 (2-0-0)

**APFE 707 Food Quality Control**
3(2-0-1)

**APFE 708 Meat & Marine Technology**
3(2-0-1)


**APFE 802 Modern Fruits and Vegetables Processing Techniques**
3(2-0-1)
Principles and methods of fruit and vegetable preservation. Composition and related quality factors for processing. Principles of storage of fruits and vegetables. Types of storate: natural, ventilated low temperature storate, DA and MA storages. Preservation of fruits and vegetables by
heat, chemicals, sugar, salt, fermentation, drying etc. Canning of fruits and vegetables, tin cans, glass containers seaming technology, aseptic canning technology. Fruit and vegetable juices, preparation of syrups, cordials and nectars, juice concentrates, pectin and related compounds, jams, jellies, marmalades, preserves. Theory of gel formation, quality control, pickles, chutneys and vinegar production, tomato products. Drying and dehydration of fruits and vegetables, problems related to storage of dehydrated products. Freezing and freeze-drying of food and frozen products. Fruit product order and quality control.

**Practicals:** Equipment for fruits and vegetable processing, plant-layout, can seaming operation, preparation of fruit juices, squashes, syrups and ready-to-serve beverages. Canning of fruits and vegetables. Preparation of jams, jellies, marmalade, preserves, and candies. Preparation of pickles, chutneys, and tomato products. Drying of fruits and vegetables, quality control of processed products. Visit to fruit and vegetables processing factories, freezing of foods, Processing of mushroom.

**APFE 803 Advanced Food Packaging**

Introduction to principals of Food Packaging, Types of packaging, Special packaging methods (vacuum, gas and shrink packaging), Function of a package, packaging materials, their structural qualities and performance including moisture and gas transmission, interaction of food and the packaging material, methods of package testing, performance evaluation and design of packaging systems for plant and animals products. Food packaging and law, shelf life testing, modern and traditional packaging material, physical and chemical properties, production, storage and recycling of packaging materials, regulation and equipment analysis of various existing packaging system and standards.

**APFE 811 Advanced Beverage Technology**


**APFE 823 Modern Baking & Confectionary Technology**


DT 820  Processing of Milk and Milk Products  3(2-0-1)

MBMT 811  Food Microbiology  4(2-0-2)
Practicals: Microscopy and micrometry. Preparation of nutrient media, sterilization and inoculation techniques, Isolation of pure culture, microbial examination of natural food products, identification of food pathogen in water, milk, cereals, pulses, oilseeds, meat and poultry. Microbial production of alcohol (cereal based), acetic acid and lactic acid.

Specialized Courses

APFE 801  Advanced Food Process Equipment Design  3(3-0-0)

APFE 810  Food Plant Design  3(3-0-0)

APFE 812  Entrepreneurship Development in Food Processing  3(3-0-0)
operation; marketing logistics; sources of technical services; commissioning and licensing; basic business law. Project proposal. Technical law standards.

APFE 815  Thermal & Non - Thermal Processing  
3(3-0-0)
Thermal destruction of microbial cells and bacteria spores; kinetics of microbial death; heat penetration into foods; method of determining lethality of thermal processes; thermal destruction of enzymes; mechanisms of heat transfer in food; blanching, pasteurization, and sterilization; thermal processing of foods in containers and outside containers; principle of aseptic technology; thermal destruction of nutrients and quality factors; optimization of the thermal processes for nutrient retention; thermal processing equipment and technology. Use of non-thermal technologies (micro filtration (UF & MP) bactofugation, ultra high voltage electric fields, irradiation, thermosonication), alternate-thermal technologies (ohmic heating, dielectric heating, infrared and induction heating) & biological technologies (antibacterial enzymes, proteins & peptides) in food processing.

APFE 816  Food Biosensors  
3(3-0-0)
Introduction to biosensors, Enzyme biosensor, optical affinity biosensors, stabilization of the biological component of the biosensor, enzyme electrode sensor for carbohydrate analysis, application of the sensors in the food industries, electronic noses for food control. Biosensors for food analysis.

APFE 817  Food Process Modelling  
3(3-0-0)
The principles of Modelling, kinetic Modelling, the Modelling of heat and mass transfer; introduction diffusion equation, the Navier-stokes equations, heat and mass transfer in porous media Luikov’s equation. Modelling thermal processes: cooling and freezing, introduction Modelling product heat load during cooling & freezing. Modelling foods with complex shapes, numerical solution of the heat conduction equation with phase change. Modelling thermal processes : heating, introduction, processing of packed and solid foods, continuous heating and cooling processes, Modelling food quality and microbiological safety.

APFE 818  Food Fermentation Technology  
3(3-0-0)

APFE 821  Functional Foods  
3(3-0-0)
Functional foods, vitamin- and mineral-enriched products, products containing added fibre, pre-, pro-, and synbiotics, and omega-3 fatty acids/oils, fortified beverages with calcium or omega-3 oils, muffins with beta-glucan, yogurts with probiotics and drinks with herb blends as well as
omega-3 eggs, meat and canola oil high in carotenoids or wheat with enhanced lutein level or rice
with other carotenoids, natural health products; beta-glucan isolated from oats, antioxidants from
blueberries, sterols and stanols from wood pulp and oils from marine and algal sources. Sensory
Aspects And Delivery Of Functional Food Ingredients

APFE 824 Food Safety Analysis
Principles of food safety – Historical developments - causes of major failure – clothing
and personal hygiene – source of contamination –test for food safety. Quality control
tools. Quality control chart –Quality factors in food – Nutritional labeling – Specification
– Rules and Regulations - need for food plant sanitation — cleaning and cleaners – Water
supply- Good Manufacturing Practice. Metal contaminants- Sources of health hazard of
metallic contaminants – Assessment of food safety – General and acute toxicity –
Mutagenicity and carcinogenicity. Additives (Intention – direct) – Preservatives –
antioxidants, sweeteners, flavors, colours, vitamins, stabilizers – indirect additives –
organic resides – inorganic residues and contaminants. Food allergy, food intolerance,
contaminants of processed foods, solvent residue, contaminants of smoked foods. Cleaner
production is food industry-fruit and vegetable processing, sea food processing, brewing
and wine processing.