

20FT005 - EMERGING TECHNOLOGIES IN FOOD PROCESSING

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45	15	-

WA/RA	SSH/HSB	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

To study about the concepts and principles of various techniques such as High Intensity Pulse techniques, Light Pulses and emerging aspects in food process engineering. To learn about the equipments used and working principle for the emerging aspects in food process engineering. To know the various applications of the new technologies in food process engineering.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Updated of the recent technological advancements in the field of Food Technology.
- Students are appraised of the alternate technologies in Thermal Processing of foods.
- The students are able to apply their knowledge on various non-destructive technological advancements in the field of Food Technology.
- Application of different hurdle technologies
- Able to understand the principle and work mechanism for several non-thermal processing

Skills

- ✓ Identify and compare various thermal and non-thermal treatment for a particular process.
- ✓ Understand process and equipment design of an emerging technique.
- ✓ Proficient knowledge of various value-added products using emerging techniques.

ACTIVITY:

Formulation of extruded products using single screw and twin-screw extruders and evaluation of its quality.

UNIT - I

Emerging technologies: Emerging technologies in food processing – necessity and advantages

High Pressure Processing (HPP): Principles of high-pressure processing, use of high pressure to improve food safety and stability. Effects of high pressure on food quality: Pressure effects on microorganisms, enzyme, texture and nutrients of food. Modelling HP processes. Other applications of high-pressure processing.

Pulsed electric fields processing (PEF): Historical background, PEF treatment systems, main processing parameters. Mechanisms of action: mechanisms of microbial and enzyme inactivation. PEF for processing of liquid foods and beverages, PEF Processing for solid foods. Food safety aspects of pulsed electric fields.

UNIT - II

Hurdle technology: Concepts and applications behavior of microorganisms during preservation, multi target preservation, minimal processing; optimal range of hurdles

Osmotic dehydration: mechanism of osmotic dehydration, effect of process parameters on mass transfer, determination of moisture and solid diffusion coefficient, application of osmotic dehydration.

UNIT-III

Membrane Filtration: membrane modules, Applications of membrane concentration.

Super critical fluid extraction processes in food materials.

Processing by radio frequency electric fields: radio frequency electric fields equipments, RFEF non-thermal inactivation of yeasts, bacteria and spores, electrical costs.

UNIT-IV

Drying: Psychrometry- equilibrium moisture contents- theory of drying – drying models Hybrid drying technologies: combined microwave vacuum drying, combining microwave vacuum drying with other processes, equipment for microwave vacuum drying, product quality degradation during dehydration.

Extrusion - cold and hot extrusion, single screw and twin-screw extruders applications, process and quality of extrudates - value addition by flaking

Atomic Energy and Plasma Technology: Uses of Atomic Energy and Plasma Technology for food preservation, Equipment used, Principle of the Technology, Benefits of the technology

UNIT-V

Ultrasound processing: fundamentals of ultrasound, ultrasound as a food preservation and processing aid, effects of ultrasound on food properties.

Microwave heating: dielectric properties of foods, heat and mass transfer in microwave processing, application of microwave processing for foods

Radiofrequency processing: dielectric heating, material properties, radio-frequency heating and drying applications;

Ohmic heating: Fundamentals of ohmic heating, electrical conductivity, modeling, treatment.

TEXT BOOKS:

1. Fellows, P. 1988. Food Processing Technology. Ellis Horwood International Publishers, Cambridge.
2. Gould, G.W.(Ed).1996. New methods of food preservation. First Edition. Blackie Academic and Professional, London.
3. Kudra, T. and A.S. Mujumdar. 2009. Advanced drying technologies. Marce I Dekker, Inc. New York

REFERENCE BOOK:

1. Leniger, H.A. and Beverloo, W.A. 1975. Food Process Engineering. First Edition D. Reidel Publishing Company, Dordrecht, Holland.
2. Marcus Karel Owen R. Fennema and Daryl B. Lund.1975. Principles of Food Science Part II, Physical Principles of Food Preservation, Marce I Dekker, Inc.NewYork.
3. Paul Singh, R. and Dennis R. Heldman. 2004. Introduction to Food Engineering. Elsevier India Pvt. Ltd., New Delhi.

Emerging Technologies in Food Processing Lab

1. Designing and determination of process parameters in HPP
2. Designing and determination of process parameters in PEF
3. Process parameters and problems regarding hurdle technology in food microbiology
4. Process Calculation for determination of osmotic dehydration in fruits and vegetables.
5. Designing and determination of Drying kinetics for food products.
6. Designing and determination of process parameters for extruder and extruded products.
7. Preservation of food by using ultrasound
8. Effect of microwave heating for food products.
9. Effect of Ohmic heating for food products.
10. Principle and design parameters for plasma technology
11. Principle and design parameters for Ohmic heating