

COURSE STRUCTURE

Of

4 YEARS DEGREE

B.Tech (Food Processing and Technology)
Department of Food Processing and Technology

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the file of
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05/04/23
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School of Vocational Studies and Applied Sciences
Gautam Buddha University, Greater Noida
Gautam Budh Nagar-201 312, U.P.



SCHOOL
of
VOCATIONAL STUDIES & APPLIED SCIENCES
GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2023

Gautam Buddha University
School of Vocational Studies and Applied Sciences
Department of Food Processing and Technology
Course Curriculum of B.Tech. (Food Processing and Technology)
Durations - 4 years (8 Semesters)
(Effective from 2023 Onward) SEMESTER –I

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
	CY101/PH101	Engineering Chemistry/ Applied Physics	3	1	0	4
	FT-MA 101	Mathematics-I	3	1	0	4
	EC101/EE102	Basic Electronics engineering/Basic Electrical Engineering	3	1	0	4
	CS101/ME101	Fundamentals of Computer Programming/ Engineering Mechanics	3	1	0	4
	BS101	Human Values & Buddhist Ethics	2	0	0	2
	EN101	English Proficiency	2	0	0	2
PRACTICALS						
	CE103/ME102	Engineering Graphics/ Workshop Practice	1	0	2	2
	CY 103/PH104	Engineering Chemistry Lab/engineering Physics Lab	0	0	2	1
	CS 181/EN151	Computer Programming Lab/Language Lab	0	0	2	1
	EC 181/EE104	Basic Electronics Lab/Basic Electrical Engineering Lab	0	0	2	1
	GP	General Proficiency	0	0	0	0
		Total	17	4	8	25
		Total Contact Hours	29			





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SEMESTER-II

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
	PH101/ CY101	Applied Physics/ Engineering Chemistry	3	1	0	4
	FT-MA 102	Mathematics-II	3	1	0	4
	EE102/ EC101	Basic Electrical Engineering/ Basic Electronics engineering	3	1	0	4
	ME101/ CS101	Engineering Mechanics/ Fundamentals of Computer Programming	3	1	0	4
	FT 111	Introduction to Food Technology	2	0	0	2
	ES101	Environmental Studies	3	1	0	4
	ME102/ CE103	Workshop Practice/ Engineering Graphics	0	0	2	2
PRACTICALS						
	EN151/ CS 181	Language Lab/ Computer Programming Lab	0	0	2	1
	PH104/CY 103	Engineering Physics Lab/ Engineering Chemistry Lab	0	0	2	1
	EE104/ EC 181	Basic Electrical Engineering Lab/ Basic Electronics Lab	0	0	2	1
	GP	General Proficiency	0	0	0	
		Total	17	5	8	27
		Total Contact Hours		30		



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SEMESTER- III

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
C	FT-201	Principles of Food Processing & Preservation	3	0	0	3
C	FT-203	Food Microbiology	3	0	0	3
C	FT-205	Food Chemistry and Nutrition	3	0	0	3
C	ME-221	Mechanics of Engineering Materials and Solids	3	1	0	4
GEI		Generic Elective 1	3	0	0	3
GEII		Generic Elective 2	3	1	0	4
OE1		Open Elective	3	0	0	3
PRACTICALS						
C	FT-251	Food Microbiology Lab	0	0	4	2
GEIII		Generic Elective 3	0	0	3	3
	GP	General Proficiency	0	0	0	0
		Total	21	2	7	28
		Total Contact Hours	30			

Generic Elective (GE) 1:

1. BT-207 Introductory Bioinformatics*
2. BT-209 Biochemistry and Biotechnology[#]
3. BT- 203 Fundamental of Biochemistry

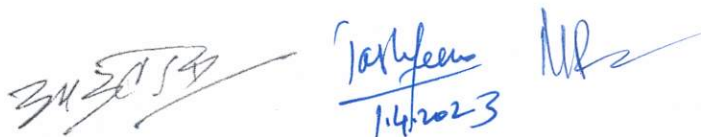
Generic Elective (GE) 2:

1. FT MA-201 Mathematics-III
2. MA-205 Quantitative Techniques in Food Technology

Generic Elective (GE) 3:

1. FT-213 Laboratory-I: Cell biology, Microbiology and Biochemistry[#]
2. BT-215 Laboratory-II: Basic Bioinformatics Lab*

Open Elective (OE): Courses from other School



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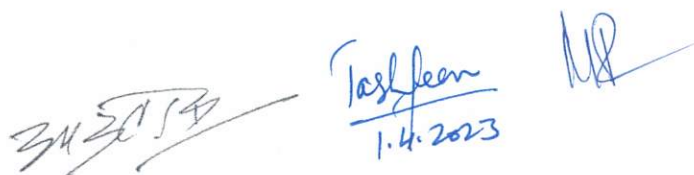
SEMESTER- IV

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
C	FT-202	Traditional and Fermented Foods	3	0	0	3
C	FT-204	Unit Operations in Food Processing	3	0	0	3
C	FT ME-206	Fluid Mechanics	3	1	0	4
SEC	EE-202	Measurements and Instrumentation	3	0	0	3
C	FT-206	Food Process Engineering	3	1	0	4
OE2		Open Elective	3	0	0	3
PRACTICALS						
C	FT-252	Food Chemistry Lab	0	0	4	2
C	FT-254	Food Processing Lab	0	0	4	2
SEC	EE-220	Measurements and Instrumentation Lab	0	0	2	1
	GP	General Proficiency	0	0	0	0
		Total	18	2	10	25
		Total Contact Hours	30			

Skill Enhancement Course (SEC)

1. EE-202 Measurements and Instrumentation
2. EE-220 Measurements and Instrumentation Lab

Open Elective (OE): Courses from other School



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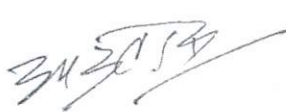


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SEMESTER-V

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
C	FT-301	Food Packaging	3	0	0	3
C	FT-303	Fruit and Vegetable Processing	3	0	0	3
C	FT-305	Advances in food process technology	3	0	0	3
C	ME-309	Heat and Mass transfer (HMT)	3	1	0	4
C	FT-315	Analytical Techniques in Food Technology	3	0	0	3
GEIV		Generic Elective	3	0	0	3
OE3		Open Elective	3	0	0	3
PRACTICALS						
C	FT-353	Food packaging and Food Quality Lab	0	0	4	2
C	FT-355	Fruit, Vegetable and Milk Products Processing Lab	0	0	4	2
		General Proficiency	0	0	0	0
		Total	21	1	8	26
		Total Contact Hours	30			

Generic Elective (GE):

1. FT 309 Entrepreneurship Development
2. FT-311 Food Additives

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SEMESTER- VI

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
C	FT- 302	Technology Of Cereals, Pulses And Oilseeds	3	0	0	3
C	FT- 304	Food Texture and Rheology	3	0	0	3
C	FT-306	Plantation Products and Spices Technology	3	0	0	3
C	ME-306	Refrigeration and Air conditioning	3	1	0	4
DSEI		Discipline Specific Elective I	3	0	0	3
DSEII		Discipline Specific Elective II	3	0	0	3
PRACTICALS						
C	FT- 352	Cereal and Pulse Processing Lab	0	0	4	2
C	FT- 354	Food Engineering Lab	0	0	4	2
	FT-356	Seminar	0	0	2	2
	FT-316	Industry Visit/Academic Visit/Village Site Visit	0	0	0	1
	GP	General Proficiency	0	0	0	0
		Total	18	1	10	26
		Total Contact Hours	29			

Discipline Specific Elective (DSE) I:

1. FT-310 Technology of Fats and Oils
2. FT- 308 Food Process Equipment Design

Discipline Specific Elective (DSE) II:

1. FT- 312 Food Processing Waste Management
2. FT-314 Technology of Frozen Food

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SEMESTER- VII

Course Type	Subject Code	Courses	L	T	P	Credits
THEORY						
C	FT- 401	Bakery and Confectionary Technology	3	0	0	3
C	FT-403	Food Storage Engineering	3	0	0	3
C	FT- 405	Dairy Process Technology	3	0	0	3
C	FT- 417	Food Safety, Quality and Regulation	3	0	0	3
DSEIII		Discipline Specific Elective III	3	0	0	3
GEVI		Generic Elective	3	0	0	3
PRACTICALS						
	FT-551	Advance Food Processing Lab	0	0	4	2
	FT-553	Dairy Processing Lab	0	0	4	2
SEC	FT-453	*Training	0	0	0	2
SEC	FT- 455	Project I	0	0	0	4
	GP	General Proficiency	0	0	0	0
		Total	18	0	8	28
		Total Contact Hours	26			

*(After VI Sem students will go for industrial training of 4 – 6 weeks)

Discipline Specific Elective (DSE III):

1. FT- 409 Food Dehydration Technology
2. FT-411 Meat Fish Poultry Processing Technology

Generic Elective (GE):

1. FT-413 Functional Foods and Nutraceuticals
2. FT-415 Flavour Technology



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SEMESTER- VIII

Course Type	Subject Code	Courses	L	T	P	Credits
SEC	FT-454	Project II	0	0	0	20
MOOCS courses/Seminar/Work shop/Research Ethics/Area Specific case study		(Open elective) OE4	3	0	0	03
		Total	3	0	0	23
		Total Contact Hours				23

Total Credits 208





B.Tech. (Food Processing and Technology)
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SEMESTER –I
FT-MA 101 (Mathematics-I) (3+1+0)

Unit-I

Sets and their representations, operations on sets, Cartesian product of sets, relations, functions, algebraic and transcendental function, Principle of Mathematical induction, Solution of quadratic equations. Permutation and Combination, Binomial Theorem.

Unit-II

Straight Lines, slope of a line and angle between two lines, various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point forms, intercepts form and normal form, general equation of a line, distance of a point from a line. Introductory idea of Ellipse, Circle, parabola and Hyperbola.

Unit-III

Trigonometric functions, positive and negative angles, Measuring angle in radians & in degree and conversion from one measure to another. Definition of trigonometric with the help of unit circle. Trigonometric identities. Complex numbers, algebraic properties of complex numbers, Argand plane and polar representation of complex numbers, Fundamental theorem of algebra.

Unit-IV

Vectors and scalars, magnitude and direction of a vector, direction cosines (and ratios) of vectors, Types of vectors, position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar product of vectors, projection of a vector on a line, vector product of vectors. Gradient, divergence and curl line integrals and green's theorem.

Unit-V

Matrices and determinants: definition of a matrix, various types of matrices, addition, subtraction, multiplication of matrices, inverse of matrix, determinant of matrices, expansion of determinant, properties of determinants, solution of linear system of equations, Cramer rule. Rank and consistency of the linear system of equations, Eigen values and eigen vectors diagonalization of matrix, Cayley-Hamilton theorem.

Textbooks:

No. of Lecture: 60


[1]. Mathematics Part I and Part II-Textbook for Class XI and XII, NCERT.

[2]. R.K.Jain and S.R.KIyengar, Advanced Engineering Mathematics, Narosa Publications.

Reference Books:

[1] H.S.Hall and S.R.Knight, *Higher Algebra*. Arihant, 2010.

[2] J. Stewart, *Calculus*, Cengage Learning, 6th Edition.

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B.Tech. (Food Processing and Technology)

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SEMESTER –II

FT-111 Introduction to Food Technology (2+0+0)

OBJECTIVE:

- The course aims to introduce the students to the area of Food science and technology and the role of food processing for human welfare. This course will enable to understand the importance of food processing with respect to the producer, manufacturer and consumer.

Unit-I: Scope, Opportunities & Challenges

Introduction to Food Science, Application of Engineering & Technology in Food Science, Need of Food Processing, Status of food processing industry in India and abroad: Growth of Indian food industry, Market scenario and scope of food industries, Potential and Future prospects of Indian food Industry.

Unit-II: Concept of Food Nutrition and Human Health

Human health and Nutrition, Recommended Dietary Allowances (RDA), Factors affecting Bioavailability of nutrients, Desirable and potentially undesirable food constituents and their Importance. Status of Malnutrition in India and Abroad: Common nutritional deficiencies such as PEM, iron, vitamin A, iodine, calcium and vitamin D, zinc etc, Emerging common degenerated disorders.

Unit-III: Basic biology related to food

Living cells, organization of living system, characteristics, Plant and animal diversity, digestion and absorption of biomolecules.

Unit-IV: Microbiological Aspects of Food

Characterization, classification and identification of microorganisms, Microscopy, Morphology and Structure, Pure culture and its characteristics, Reproduction Growth and Cultivation, Control of microorganisms, beneficial uses of microbes in foods, General Principles of food hygiene.

OUTCOMES:

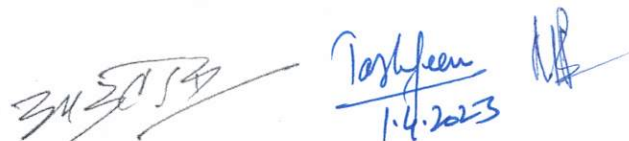
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On completion of the course, the students are expected to

- Be aware of the different methods applied to processing foods.
- Be able to understand the significance of food processing and the role of food and beverage industries in the supply of foods.

Reference Books

1. Introduction to Food Science and Technology. 1973. By George Stewart. Academic Press.
2. Food Science. 1995. By Potter, Norman N., Hotchkiss, Joseph H. Fifth edition.
3. Lehninger Principle of biochemistry. 2004. by David L. Nelson and Michael M. Cox, Fifth edition.
4. Microbiology. 2001. By Michael J. Pelczar JR., E.C.S Chan, Noel R. Krieg.
5. Foods Facts and Principles. 2008. by N. Shakuntala Manay.

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B.Tech. (Food Processing and Technology)
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SEMESTER –II

FT-MA-102 (Mathematics-II) (3+1+0)

Unit-I

Limit, continuity and differentiability of functions, Derivatives of elementary functions, rules of differentiation, Derivatives of polynomial and trigonometric functions, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function, logarithmic differentiation. Derivative of functions expressed in parametric forms, successive differentiation.

Unit-II

Successive differentiation, Leibnitz Theorem, Partial differentiation, Euler Theorem, Taylors series (Single Variable), Maxima and Minima(Single Variables),Fundamental theorem of calculus.

Unit-III

Integration as inverse process of differentiation, Integration of elementary functions, integration by substitution, by partial fractions and by parts, Fundamental theorem of calculus, Basic properties of definite integrals and evaluation of definite integrals, definite integrals limit of sum, Application to area sand curves

Unit-IV

Definition of ordinary differential equations, order and degree, general and particular solutions of a differential equation, Formation of differential equation, solution of differential equations of first order and first degree: solution by method of separation of variables, homogeneous differential equations, linear differential equations, exact differential equations, Solution of second order differential equations with constant coefficients. Euler's Cauchy equation Wronskian method of variation of parameters and power series for ordinary points.

Unit-V

Introduction to mathematical modeling, modeling of Simple elementary biological system, population growth model, exponential models, logarithmic models

Textbooks:

[1] Mathematics Part I and Part II-Textbook for Class XI and XII, NCERT.

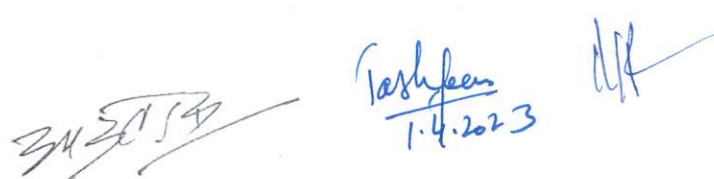
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Reference Books

[1] G. B. Thomas and R. L. Finney, *Calculus and Analytical Geometry*, Pearson Education.

[2] J. N. Kapoor, *Mathematical Modeling*, New Age International.

[3] J. Stewart, *Calculus*, Cengage Learning, Sixth Edition.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 Onward)
SEMESTER –III
FT-MA-201 (Mathematics-III) (3+1+0)

Unit-I

Numerical Method - Solution of systems of linear equations using LU decomposition, Gauss elimination method; Lagrange and Newton's interpolations; solution of polynomial and transcendental equations by Newton-Raphson Method; Numerical integration by trapezoidal rule and Simpson's rule; Numerical solutions of first order differential equations by explicit Euler's method.

Unit-II

Probability and Statistics - Axioms of probability; Conditional probability; Bayes' Theorem; Mean, variance and standard deviation of random variables; Binomial, Poisson and Normal distributions; Correlation and linear regression.

Unit-III

Complex Variables - Complex numbers, Argand plane and polar representation of complex numbers; DeMoivre's theorem; Analytic functions; Cauchy-Riemann equations.

Unit-IV

Calculus - Sequences and series: Convergence of sequence and series; Tests of convergence of series with non-negative terms (ratio, root and integral tests); Power series; Taylor's Fourier Series of function of period 2π .

Unit-V

Multivariable Calculus - Limits, Continuity and differentiability in higher dimensions, Partial differentiation, Chain rules, Jacobian, Directional Derivatives and Gradient Vectors, Tangent plane and Normalline, Extreme values and Saddle points, Lagrange's multiplier method. Taylor's series for a function of several variables. Curvature and Torsion, Unit binomial vector.

Textbooks:

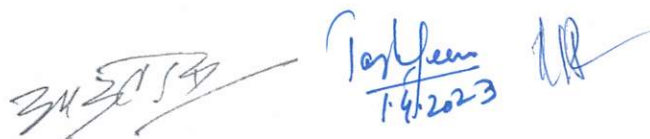
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No. of Lecture:

[1]. R.K. Jain and S.R. Kiyengar, Advanced Engineering Mathematics, Narosa Publications.

Reference Books:

- [1] Thomas, G.B., Weir, M.D., Hass, J., & Giordano, F.R. (2005). Thomas' calculus (pp.2379-8858). Addison-Wesley.
- [2] Kreyszig, E., Stroud, K., & Stephenson, G. (2008). Advanced engineering mathematics. Integration, 9(4).
- [3] Strauss, M.J., Bradley, G.L., & Smith, K.J. (2007). Calculus, Dorling Kindersley (India) Pvt. Ltd.
- [4] Jain, R.K., & Iyengar S. R.K. (2016). Advanced Engineering Mathematics, Narosa Publishing House.

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B.Tech. (Food Processing and Technology)

(Effective from 2023 Onward)

SEMESTER –III

FT-201 Principles of Food Processing and Preservation (3+0+0)

OBJECTIVE:

- To expose the students to the principles and methods of food processing and preservation.

Unit –I

Aim and Objective : Aim and objectives of preservation and processing of foods, degree of perishability of natural foods, Quality deterioration and spoilage of perishable foods, Water activity and its significance in food preservation, intermediate moisture foods, types of food spoilage, viz. microbiological, enzymatic, chemical, physical and their effects on food quality. Psychrometric Charts.

Unit -II

Low temperatures Preservation: Storage of foods at chilling temperature, applications and procedures, controlled and modified atmosphere storage of foods, post storage handling of foods. Freezing process, slow and fast freezing of foods and its consequences etc. Technological aspects of pre-freezing, Actual freezing, frozen storage and thawing of foods, IQF.

Unit -III

High temperature Preservation: Thermal processing principles, pasteurization and sterilization, Death Time (TDT) curve; ultra-heat treatment UHT processing; Industrial applications of canning and bottling: commercial canning operation, spoilage of canned food and its quality evaluation, Extrusion Cooking.

Unit -IV

Chemical methods of Preservation: Definitions and classifications, bacteriostatic agents, Fungistatic agents, germicidal agents, antioxidant, neutralizers, stabilizers and firming agents, use of sulphur dioxide and benzoic acid, tolerance of chemical preservative, use of antibiotics, sugars and salts. Preservation by fermentation and irradiation; technological aspects and applications of sugar and salt, antimicrobial agents.

Unit-V Radiation methods of Preservation: Irradiation of foods type of radiations, physical and chemical changes induced by radiations, interaction of radiation with living organisms. Radiated foods, cost, shelf life, nutrient and other losses, wholesomeness, safety of working personnel and dosimetry.

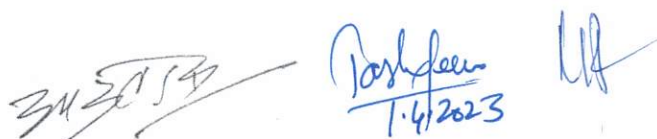
OUTCOMES

No. of Lecture: 45

.To understand the role of different methods the processing of different foods and their impact on the shelf life, quality, and other physical and sensory characteristics of foods.

Books Recommended:

1. Principles of Food Science-Part-II: Physical Method of Food Preservation by M.Karel,
2. Preservation of fruits and Vegetable processing by Girdhari Lal (2009)
3. Singh, M.K. "Food Preservation" Discovery Publishing, 2007.
4. Fellows,P.J. "Food Processing Technology: Principles and Practice".2nd Eds, CRC2000.
5. Gopala Rao, Chandra. "Essentials of Food Process Engineering". B.S. Publications, 2006.

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B.Tech. (Food Processing and Technology)
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SEMESTER –III
FT-203 Food Microbiology (3+0+0)

OBJECTIVE:

- To provide awareness about nutrition and growth of microorganisms.
- To impart knowledge about role of microorganisms in air, water and soil.
- To understand the role of microorganisms in fermented foods, food spoilage, food infections and intoxications.

Unit- I

Introduction, history and scope of food microbiology. Classification of microbes, Types of microorganisms associated with food; bacteria, yeast, mold. Microbial growth, Factors affecting growth of microorganisms: Intrinsic and extrinsic factors.

Unit- II

Source of microorganism in foods, Biochemical changes caused by microorganism, Microbial spoilage of : milk, fruits and vegetables, cereals and cereal products, meat, fish , poultry and eggs; and canned foods. Fermented Food products. Importance of microorganism in food industry.

Unit- III

Heat Resistance of microorganisms and spores. Decimal reduction time (D values), 12D concept, Thermal Death Time curves. Control of Microorganisms & Food Preservation methods. Hurdle Technology and its applications. HACCP and its applications.

Unit- IV

Foods microbiology and public health - Types of food poisonings, important features and control; Overview of bacterial, fungal and viral food borne illnesses. Toxins from microbes: *Staphylococcus aureus*, *Clostridium botulinum* and *Aspergillus* genera. Indicator microorganisms.

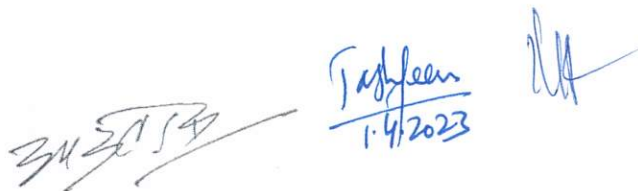
OUTCOMES:

No. of Lecture: 45

After the completion of the course, the students will be able to explain the microbiology of various food products.

Reference Books

1. James M. J. (2000) Modern Food Microbiology, 5th Edition, CBS Publishers.
2. Barnart G. J. (1997) Basic Food Microbiology, CBS Publishers.
3. Adam M. R. & Moss M. O. (1995) Food Microbiology, New Age International Pvt. Ltd. Publishers.
4. Bibek Ray (1996) Fundamental Food Microbiology, CRC Press.


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B.Tech. (Food Processing and Technology)
(Effective from 2023 Onward)
SEMESTER-III
FT-205 Food Chemistry and Nutrition (3+0+0)

OBJECTIVE:

- The course aims to develop the knowledge of students in the basic area of Food Chemistry.
- This is necessary for effective understanding of food processing and technology subjects.
- This course will enable students to appreciate the similarities and complexities of the chemical components in foods.

Unit-I

Introduction to food chemistry, water and Carbohydrate: Water in Foods: Structure, Properties, Interactions, Water activity and sorption isotherm, molecular mobility and food stability Carbohydrates: Classification, Functions, Reactions and properties of simple and complex carbohydrate, Selection of Natural or Modified carbohydrates for incorporation into processed food.

Unit-II

Lipids: Classification, Consistency of commercial fat, Lipolysis, Auto oxidation, Thermal decomposition and effect of ionizing radiation, Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional and safety aspects of natural and modified fats.

Unit-III

Proteins: Classification, nutritional and functional properties of food proteins, Nutritive value and its Determination, Chemical reactions and interactions of amino acids and proteins, Denaturation and its implications, Functional properties of food proteins, Modification of food proteins in Processing, storage, and its implications.

Unit-IV

Vitamins, Minerals and Pigments : Sources, Functions, Deficiency diseases, Chemistry and stability of water and fat-soluble vitamins during processing, Chemical properties of minerals and their bioavailability, Enrichment and fortification. Natural pigments in foods and their retention in processed foods.

Unit-V

Introduction to the Concept of Nutrition: Dietetics, Balance diet, B.M.R: Definition, factors affecting B.M.R. BV, NPU, BMR, PER calculations. Functions of water and dietary fiber. Classification of balanced diet, Malnutrition, Type of Malnutrition, Causes and preventions of malnutrition.

OUTCOMES

No. of Lecture: 45

On completion of the course the students are

- Be able to understand and identify the various food groups; the nutrient components .
- Be able to understand and identify the non-nutritive components in food, naturally present.

References:

1. Bahl BS and Bahl A (2012): Advanced Organic Chemistry. 21st ed. New Delhi: S. Chand Publishing.
2. Food Chemistry by O.R. Fennema
3. Food Facts and Principal by N. ShakuntalaManay& M. Shadaksharaswamy
4. Chopra, H.K. and P.S. Panesar. "Food Chemistry". Narosa, 2010
5. Mann, Jim and Stewart Truswell "Essentials of Human Nutrition". 3rd Edition. Oxford University Press, 2007.


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)

Semester-IV

FT- 202 Traditional and Fermented Foods (3+0+0)

OBJECTIVES:

- To understand the concept of basic fermentation processes and its control systems etc.
- To help students acquire a sound knowledge on diversities of foods, food habits and patterns in India with focus on traditional foods.

Unit -I

Introduction to traditional foods, traditional sweet, savory and snack food products: Sweetmeats, Namkins, Papad, Idli, Dosa, Kimchi, Sauerkraut, Kefir, Kombucha etc.

Unit -II

Preparation and Maintenance of Bacterial, Yeast and Mold cultures for food fermentations. Microbial growth and death kinetics, Lactic acid bacteria-activities and health-promoting effects. Production of antibiotics, biofuels, prebiotics and probiotics, Mushrooms: Cultivation and preservation.

Unit -III

Fermented Foods: Fermentation as method of preparing and preserving foods, microbes and their uses in pickling, producing colours, flavours, and alcoholic beverages. Fermented meat and fish products. Fermented Dairy Products: Cheeses, Curd and Yoghurt, Buttermilk and the Fermented Milks. Spoilages and defects of fermented dairy products and their control.

Unit-IV

Overview of fermentation industry, general requirements of fermentation processes, basic configuration of fermenter and ancillaries, main parameters to be monitored and controlled in fermentation processes. Microorganisms used in Fermentation Industry, Simple, Fed batch and Continuous fermentation.

Unit-V

Criteria for good medium, medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation of optimal growth and product formation, examples of simple and complex media, design of various commercial media for industrial fermentation– medium optimization methods

OUTCOMES:

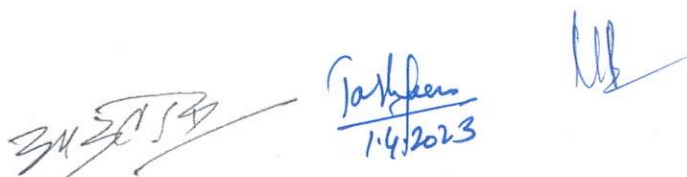
No. of Lecture: 45

The student will be able to

- Understand the concept of basic fermentation processes and its application.

Reference Books

1. K.H. Steinkrus Handbook of Indigenous Fermented Foods
2. Sukumar De Outlines of Dairy Technology
3. Prescott & Dunn Industrial Microbiology 4. L.E. Casida Industrial Microbiology
4. Bailey, J.E. and Ollis, D.F. "Biochemical Engineering Fundamentals", 2nd Edition, McGraw Hill, 1986.


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
SEMESTER-IV

FT-204 Unit Operations in Food Processing (3+0+0)

OBJECTIVE:

- To impart of knowledge of different unit operations of food industries.
- To introduce the concept of material and energy balance as applied to food engineering systems.

Unit -I

Review of Basic engineering mathematics; units and dimensions; mass and energy balance. Principles of Fluid Flow-Introduction to stress-strain behavior in materials; properties of fluid viscosity; capillary tube viscometer; power law equations for Pseudoplastic; Newtonian and Dilutant fluids; flow in pipes-friction; laminar and turbulent flow equations; considerations in pumping fluids.

Unit-II

Introduction to Unit operation, cleaning, grading and sorting, Mixing, Kneading, Blending, Homogenization, Sedimentation, Extraction, Leaching, Agitation. Unit operations involved in development of various food products.

Unit-III

Size Reduction-Principles, types of equipments, applications and energy laws, screening of solids, size measurements and analysis, standard sieves, membrane separation process, Mixing: objectives, equipments for solid, liquid mixing, energy requirements, mixing indices.

Unit-IV

Food dehydration- Basic principles of dehydration, Constant rate and falling film rate periods of dehydration; equilibrium moisture content, fixed bed dehydration; drum dehydration, fluidized bed drying; Spray drying of liquid foods, different types of dryers and their applications in food processing sector.

Unit-V

Food freezing- Properties of frozen foods; freezing point depression, general introduction to enthalpy change during freezing, Plank's equation for predicting freezing time, Evaporation-Thermodynamics of evaporation; boiling point of elevation; heat transfer during evaporation; heat transfer coefficients, design of evaporation system; retention time; single effect and multiple effect system; thermo-compression systems.

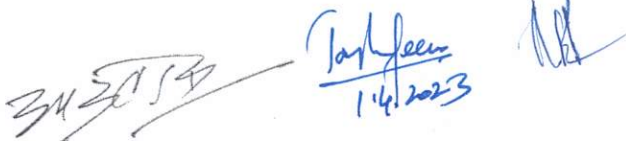
OUTCOME

No. of Lecture: 45

- To understand Principles of separation methods used in the process industry. To appreciate different equipment developed for separation.

Reference Books

1. Unit Operations of Agricultural Processing by Sahay K.M. and Singh K.K., Vikas Pub.
2. Physical Properties of Plant and Animal Products by Mohsenin N.N., Gordon and Breach.
3. Unit operations of chemical engineering by McCabe and Smith, McGraw-Hill.
4. Introduction to Food Engineering, 3rd Eds, R Paul Singh, Academic Press, USA.
5. Food Processing Technology: Principles and Practice, P J Fellows, Woodhead Pub Ltd.


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-IV
FT-206 Food Process Engineering (3+1+0)

OBJECTIVES:

- To understand the area of Food engineering
- To elaborate the basic concepts of material and energy balance, fluid dynamics.

Unit-I

Introduction to food process engineering. Material balance for two component system, equation for operating lines and feed line. Numerical problems on material and energy balance related to food processing. Kinetics of biological reactions - kinetics of reactions occurring in processed foods, reaction velocity constant, order of reaction; quality changes during storage of foods; application of Arrhenius equation to biological reactions.

Unit-II

Evaporation: Boiling point elevation, Duhring rule, basic principles of evaporators; capacity and economy of evaporator; multiple effect evaporator: operation and various feeding systems, calculation of heat transfer area in single and multiple effect evaporators; Thermal vapour recompression and Mechanical vapour recompression system to improve evaporator economy; numerical problems.

Unit-III

Principles of thermodynamics and heat transfer applied to food engineering; fundamentals of heat and analogy to mass transfer in food processing. Modes of heat transfer and overall heat transfer coefficient; thermal properties of foods: specific heat, thermal conductivity; Fourier's law, steady state and unsteady state conduction; energy balances; rate of heat transfer; thermal boundary layer; natural and forced convections heat transfer; heat transfer to flat plate and in non Newtonian fluids; heat transfer in turbulent flow; heating and cooling of fluids in forced convection outside tubes.

Unit-IV

Principle of filtration, types of filtration equipments, settling classifiers, flotation and centrifugation, types of centrifuge.

Unit-V

Freezing and Crystallization: Basic concepts, theories of crystallization; Depression in freezing point, Planks equation and other modified equations for prediction of freezing time, freezing time calculations for a product having uniform temperature (negligible internal resistance), different types of freezers and crystallizers.

OUTCOMES:

- Understand various basic aspects of food engineering.
- Grasp the knowledge about fluid flow of foods.

No. of Lecture: 60

Reference Books

1. Food Engineering Operation – Brennan, Butters, Cowell and Lilly.
2. Food Process Engineering – Heldman, D. R. and Singh, R. P.
3. Fundamental of Food Process Engineering – Romeo T. Toledo
4. Unit Operation of Chemical Engineering – Mc Cabe, Smith and Harriot
5. Mass Transfer Operation – Treybal, R. E.


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1.4.2023

B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-IV
FT-ME-206- Fluid Mechanics (3+1+0)

Unit-I

Introduction to fluid flow: Fluid and their Properties; Rheological concept of fluid, difference between solids, liquids and gases, ideals and real fluids. Physical properties of fluids like mass density, specific gravity, viscosity, pressure, surface tension, capillarity, vapor pressure and cavitations; compressibility and bulk modulus; factors affecting the rheological parameters; Newtonian and non-Newtonian fluids; fluid pressure and its measurement; manometers, simple manometers, differential manometers; concept of Reynolds's number.

Unit-II

Fluid flow measurement:

Derivation of continuity equation; different types of energies of a liquid in motion; derivation of Bernoulli's equation; practical applications of Bernoulli's equation like venturi meter, orifice meter, pitot tube, rotameter. Numerical problems.

Unit-III

Laminar viscous fluid flow:

Flow of viscous fluid through circular pipe, Coefficient of friction; head loss due to Friction in pipes; head loss due to sudden enlargement, contraction, vena contract, entrance and exit losses; Stokes law (laminar flow around a sphere); laminar flow through porous media; pressure drop in flow through porous media. Turbulent flows and flow losses in pipes.

Unit-IV

Pumps: Types of pumps and classification criteria, Theory and working of centrifugal pump, reciprocating pumps, external gear pump (rotary pump), Lobe pump, Vane pump etc.

Viscometry: Theory and working of capillary tube viscometer for Newtonian and non-Newtonian fluids; Falling sphere resistance method; Rotational viscometer; Cone and plate type viscometer; Circular disc viscometer.

Unit-V

Fluidization: Physical properties of particles like size, shape, sphericity, porosity, superficial and interstitial velocity, hydraulic radius, equivalent diameter etc. Mechanism of fluidization, characteristics of gas – solid fluidized systems, Fanning friction factor for porous media; minimum porosity, bed weight, pressure drop in fluidized bed, theory and analysis of fluidization process; particulate fluidization; aggregative (or bubbling) fluidization; principle of fluidized bed drying equipment; pneumatic conveyers. Numerical problems.

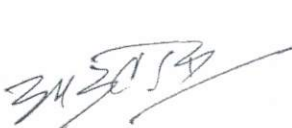
No. of Lecture: 60

Textbooks:

1. Fluid Mechanics- Fundamentals and Applications; Yunus A. Cengel, John M. Cimbala; McGraw-Hill Publications.
2. Fluid Mechanics and Hydraulic Machines; R. K. Bansal; Laxmi Publication.
3. Fluid Mechanics and Machines; S. K. Som; Tata McGraw Hill.

Reference Books:

1. Hydraulics and Fluid Mechanics; P. N. Modi and S. M. Seth; Rajsons Publications.
2. Fluid Mechanics; F. M. White; McGraw-Hill Publications.
3. Fundamental of Fluid Mechanics; B. R. Munson; D. F. Young and T. H. Okishi; Wiley India.



B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-V
FT-301 Food Packaging (3+0+0)

OBJECTIVE:

- To develop the knowledge of students in the area of packaging of foods.
- To appreciate the application of scientific principles in the packaging of foods.

Unit-I

Introduction to food packaging, Objectives and functions of packaging and packaging material. Current status and global trends in food packaging. Packaging requirements and selection of packaging materials, properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation.

Unit-II

Packaging Materials:**Paper as Package Material:** Pulping, Manufacture, Types of paper, Paperboard Products. Glass Packaging Materials: Introduction. Composition and Structure. Physical Properties. Manufacture.**Metal Packaging Materials:** Introduction. Manufacture of Tinplate: Manufacture of Pig Iron, Steelmaking, Tinplating. Manufacture of ECCS. Manufacture of Aluminium. Container-Making Processes. **Plastics:** Plastic as package material, types of plastic films and their properties, Extrusion, Coating and Laminating, Injection Molding, Blow Molding, Edible Packaging Materials, Biobased and Biodegradable Packaging Materials.

Unit-III

Barrier Properties of Thermoplastic Polymers: Theory of permeability, Steady-State Diffusion, Unsteady-State Permeation, Permeability Coefficient Units, Factors Affecting the Diffusion and Solubility Coefficients, Permeability of Multilayer Materials, Measurement of Permeability: Gas Permeability, Water Vapor Permeability, Permeability of Organic Compounds.

Unit-IV

Prediction of shelf life of foods, selection and design of packaging material for different foods Different packaging system for dehydrated foods, frozen foods, dairy products, fresh fruits and vegetables, meat, poultry and sea foods. Aseptic Packaging, Vacuum Packaging, Spray Drying, Tray Drying, Migration Test of packaging materials (Overall Migration Test), Estimation of shelf-life of packaged food stuff.

UNIT V

Environmental issues in packaging: Coding and marking including bar coding and Environmental, ecological & Economic issues, recycling and waste disposal, FSSAI Packaging and Labelling Rules and Regulation

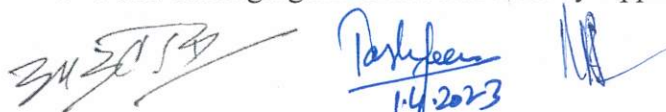
OUTCOMES

No. of Lecture: 45

- The different types of materials and media used for packaging foods.
- Hazards and toxicity associated with packaging materials and laws, regulations.

Reference Books

1. Food Packaging Materials by M. Mahadeviah and R.V. Gowramma
2. Principles of Food Packaging by Saclarow and R.C. Griffin
3. A Handbook of Food Packaging Frank A. Paine Blackie Academic
4. Food Packaging Materials N.T.Crosby Applied Science

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B.Tech. (Food Processing and Technology)
(Effective from 2023)
Semester-V
FT-303 Fruit and Vegetable Processing (3+0+0)

OBJECTIVES:

- To develop the knowledge of students in the area of vegetable and fruit processing.
- To appreciate the application of scientific principles in processing of fruits and vegetables.

Unit-I

Introduction, definition and importance of postharvest technology. Present scenario of fruits and vegetable industry (processing) in India. Selection of raw fruits and vegetable products. Physiological and biochemical changes during postharvest. Handling and preservation of fresh fruits and vegetables.

Unit-II

Principles involved in preparation of squashes, cordials nectars, fruit drinks and carbonated beverages and its quality control. Technology used for making of Jam, its constituents, selection of fruits and defects. Preservation of fruit juices by pasteurization, drying, tetra packaging, retortable pouches, aseptic canning, carbonation and chemical preservation with use of sugars and other preservatives.

Unit-III

Fruit and vegetable products: Jellies and Marmalades. Preserves, candies and crystallized fruits. Tomato products: Selection of materials, processing of Puree, Paste, Ketchup, Sauce and soup. Technology for making of various pickles, Chutneys. Cause of spoilage causing bacteria role of preservatives in pickle making.

Unit-IV

Canning: Introduction and principle of canning. Machinery and equipments for packing, lacquering, syruping and brining. Spoilage in canned foods, storage and handling of canned foods. Emerging food processing technologies: Microfiltration, membrane processing, high voltage pulse techniques, photodynamic inactivation, high pressure treatment, microwave processing- heating, ionizing radiation, heating of electrical resistance effect and induction.

Unit-V

Principles involved in various equipment employed in fruits and vegetable processing. Drying of products and drying kinetics, packing. Condiments, spice oils, oleoresins, Processing of cashew nuts, coffee and cocoa beans, and tea leaves, Specialty fruit and vegetable products.

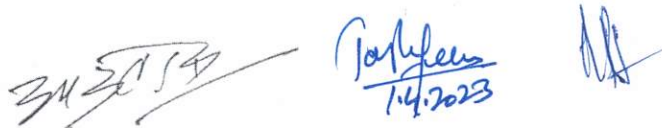
OUTCOME

No. of Lecture: 45

- To develop skills related to preservation and analytical techniques.
- Use of various techniques and additives for fruit and vegetable processing and quality analysis.

Books Recommended:

1. Pruthi, J.S. (1980). Spices and Condiments: Chemistry, Microbiology and Technology. 1st Edn. Academic Press Inc., New York, USA.
2. Preservation of fruits and vegetables Girdharilal, Siddappa, G.S and Tandon, ICAR, 1976 New Delhi
3. Foods: Facts and Principles by N Shakuntala manay; New Age International (P) Ltd.
4. Fruits and vegetables: Preservation Technology, Narang RK.
5. Chocolate, Cocoa and Confectionary: Science and Technology by Bernard. W. Minifie.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
SEMESTER- V

FT- 305 Advances in Food Process Technology (3+0+0)

OBJECTIVES:

- The course aims to develop the knowledge of students in the area of emerging or alternative technologies applied to food processing.
- This course will enable students to understand the advantages and disadvantages over existing technologies.

Unit – I

Modelling of Microbial Food Spoilages: Microbial growth dynamics models, partial differentiation equation models, application of models in thermal preservation, Concept, mechanism of microbial destructions, equipments etc.

Membrane Technology: Introduction to pressure activated membrane processes, performance of RO/UF and NF and industrial application.

Unit – II

Supercritical Fluid Extraction: Property of near critical fluids (NCF), solubility and efficiency of NCF extraction, equipment and experimental techniques used in NCF extraction and industrial application.

Use of Microwave Energy in Foods: Theory of microwave heating, dielectric properties of food materials, working principle of magnetron, microwave blanching, sterilization and finish drying.

Unit – III

Hurdle Technology: Types of preservation techniques and their principles, concept of hurdle technology and its application.

High Pressure Processing of Foods: Concept of high-pressure processing, quality changes, effects of pressure on microorganisms and its application in food processing.

Unit – IV

Ultrasonic in Food Processing: Properties and generation of ultrasonic, ultrasonic imaging, application of ultrasonics as an analytical tool and processing techniques

Newer Techniques in Food Processing: Application of technologies of high intensity light, pulse electric field, ohmic heating, micronization in food processing and preservation

Nanotechnology: Principles, mechanism and applications in foods.

OUTCOMES:

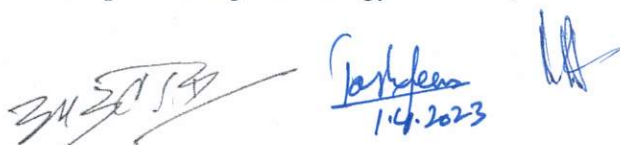
Number of Lectures : 45

On completion of the course the students are expected to

- Be able to understand and identify the different processing technologies and their application.
- Understand the application of scientific principles in the processing technologies specific to the materials.

Books Recommended:

1. G. W. Gould. New Methods of Food Preservation (Non Thermal Processing of Foods)
2. R. P. Singh. Introduction to Food Engineering
3. Food processing technology. Fellows, P. J.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-V
FT-309 Entrepreneurship Development (3+1+0)

OBJECTIVES:

1. Will teach the importance, the ways and management of new product into the market.
2. Will impart the basic knowledge of taxes, patent rules, excise rules, act of wages.
3. Explain the Government policies on small, medium and large scale industries.
4. Provide the working of various government & private agencies & apex bodies of food.

Unit- I

Entrepreneurship: Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, Development of entrepreneurship; Culture, stages in entrepreneurial process.

Unit- II

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility analysis, Economic, Marketing, Financial and Technical; Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving, Heuristics, Brainstorming, Synectics, Value Analysis, Innovation.

Unit-III

International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestic entrepreneurship, Stages of economic development. Institutional support for new ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small scale Industries, Govt. Policies for SSIs.

Unit IV

Family and Non Family Entrepreneur: Role of Professionals, Professionalism vs family entrepreneur, Role of Woman entrepreneur. Venture Capital: Venture capital, Nature and Overview, Venture capital process, locating venture capitalists.

OUTCOMES:

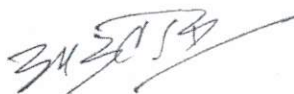
No. of Lecture : 60

After the completion of the course, the students will be able to:

- Understand the importance of various aspects agribusiness management.
- Able to introduce new product and its marketing strategies.
- Will guidance entrepreneurs in legal matters and tax management.

Books Recommended:

1. Bridge et al (2003), Understanding Enterprise: Entrepreneurship and Small Business.
2. Holt (1990) Entrepreneurship, New Venture Creation, Prentice-Hall.
3. Dollinger MJ (1999) Entrepreneurship, Prentice-Hall.
4. Desai A.N (1990), Entrepreneurship And Environment.
5. Roy, Rajeev. Entrepreneurship Management. Oxford University Press.



Tarhyan
1.4.2023



B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-V
FT-311 Food Additives (3+1+0)

OBJECTIVES:

1. To get an insight into additives that are relevant to processed food industry for shelf life extension, processing aids and sensory appeal.
2. To explain about role of food additives in food quality control.
3. To explain the techniques of best use of food additives.
4. To describe the role of food additives in health maintenance and cure of diseases

Unit - I

Food Additives: definitions, classification and applications, food preservatives-classifications, antimicrobial agents, types and their action, safety concerns, regulatory issues in India, international legal issues; Antioxidants (synthetic and natural, mechanism of oxidation inhibition); Chelating agents: types, uses and mode of action; Coloring agents: color retention agents, applications and natural colorants, sources of natural color, misbranded colors, color extraction techniques, color stabilization.

Unit - II

Flavoring Agents: flavors (natural and synthetic flavors), flavor enhancers, flavor stabilization, flavor encapsulation; Flour improvers: leavening agents, humectants and sequesterant, hydrocolloids, acidulants, pH control agents buffering salts, anticaking agents.

Unit - III

Sweeteners: natural and artificial sweeteners, nutritive and non-nutritive sweeteners, properties and uses of saccharin, acesulfame-K, aspartame, corn sweeteners, invert sugar sucrose and sugar alcohols (polyols) as sweeteners in food products; Emulsifiers: types, selection of emulsifiers, emulsion stability, functions and mechanism of action.

Unit - IV

Nutrient supplements & thickeners: polysaccharides, bulking agents, antifoaming agents, synergists, antagonists; additives food uses and functions in formulations, permitted dosages, indirect food additives; harmful effects/side effects associated with various additives (various diseases). Food additives legislations; FSSAI/FDA/EU.

OUTCOMES:

No. of Lecture: 60

After the completion of the course, the students will be able to:

1. Understand about the use of food additives in food formulations.
2. Apprehend the suitable application of food ingredients in health foods.
3. Grasp the techniques of food additives stability and use level.
4. Understand the role of food additives in health maintenance and cure of diseases

Books Recommended:

1. Branen A.L., Davidson P.M., and Salminen S. (2001) Food Additives. 2nd Ed. Marcel
2. George A. B., (1996) Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
3. George A. B., (2004) Fenaroli's Handbook of Flavor Ingredients 5th Ed. CRC Press.
4. Stephen A. M., (2006) Food Polysaccharides and Their Applications. Marcel Dekker.





B.Tech (Food Processing and Technology)
(Effective from Session 2023 onward)
Semester-V

FT-315 Analytical Techniques in Food Technology (3+0+0)

OBJECTIVE To enable the students to understand the principles and methods of advanced techniques in the analysis of foods

Unit - I

Principles and techniques used in food analysis: Natural product analysis (alkaloids, flavonoids and terpenoids etc.), Textural profile analysis of foods, Quantification of sensory Attributes- Artificial Tongue, Artificial Nose.

Unit - II

Chromatographic techniques: Basis of chromatography, Paper, TLC, size exclusion, ion exchange, affinity chromatography. HPLC and GC: Concepts and principles, methodology, instrumentation and applications.

Unit - III

Spectroscopic techniques: Fundamental principles, spectral behaviour, UV-Visible spectroscopy, Atomic absorption spectroscopy, Fluorescence spectroscopy, Emission spectroscopy, Mass-spectroscopy, IR..

Unit - IV

Microscopic techniques: Light microscopy: Bright-field microscopy; Dark-field; Phase contrast microscopy; Fluorescence microscopy; Confocal Laser Scanning Microscope (CLSM). Electron microscopy: Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) .

Unit -V

Separation techniques: Electrophoresis: Principle, types, procedure and applications. Supercritical fluid extraction (SFE): Basic principles, Instrumentation and applications.

Miscellaneous techniques: ICP, Polarimetry, Refractometry, particle size analysis.

OUTCOME

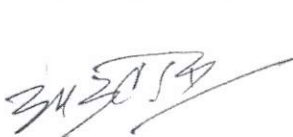
Number of Lectures:45

The students will learn the following skills:

1. Various techniques and the application of these techniques to the separation and analysis of multi-component samples.
2. Testing of natural product.

Books Recommended:

1. AOAC International. 2003. Official methods of analysis of AOAC.International.17th Ed. Gaithersburg, MD, USA, Association of AnalyticalCommunities.
2. Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific &Technical.
3. Leo ML. 2004. Handbook of Food Analysis. 2 nd Ed. Vols.I-III.
4. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products.VCH.
5. MacleodAJ.1973. Instrumental Methods of Food Analysis. Elek Sci.MarcelDekker.



B.Tech. (Food Processing and Technology)

(Effective from 2023 onward)

Semester-VI

FT-302 Technology of Cereals, Pulses and Oilseeds (3+0+0)

OBJECTIVE:

- The course aims to develop the knowledge of students in the area of pulse and oilseed processing and technology.
- This is necessary for effective understanding specific aspects of food processing related to these foods. This course will enable students to appreciate the application of scientific principles in the processing of these materials.

Unit-I

Composition, Structure and Processing characteristic of Cereal grains and Pulses, Post-harvest, Processing practices for their safe storage. Parboiling and Milling of paddy, Quality characteristics, curing and aging of rice, processed rice products.

Unit-II

Wheat and its quality characteristics for milling into flour and semolina, Flour milling, air classification, Flour grades and their suitability for baking purposes, Assessment of flour quality and characteristics, Macaroni products.

Unit-III

Dry and Wet milling of corn, Starches and its conversion products, malting of barley, Pearling of Millets, Milling of legume-pulses by traditional and improved processes.

Unit-IV

Anti-nutritional factors in pulses and their methods of inactivation; pretreatments; Traditional and modern milling methods and equipment involved; By-products of pulse milling and their utilization.

Unit-V

Processing of Oilseeds: Processing of oil seeds for direct use and consumption, Oil and protein products, Refining, Hydrogenation and Interesterification of oil, Processing of de-oiled cake into protein concentrates and isolates, Textured protein, Functional protein preparations, Peanut butter, Margarine and Spread.

OUTCOMES

No. of Lecture: 45

On completion of the course the students are expected to

- Understand the application of scientific principles in the processing technologies.
- Grasp the changes in the composition of foods with respect to the type of processing technology used.

Books Recommended:

1. Cereal Technology by S.A.Matz
2. Bakery Technology S.A.Matz
3. Technology of Cereals, by NL. Kent, Pergamon Publisher
4. Chakraverty A & De DS. 1981. Post-harvest Technology of Cereals, Pulses and Oilseeds. Oxford & IBH.
5. Mysore Manuals on Rice and its Processing C.F.T.R. I



B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)

OBJECTIVE:

Semester-VI

FT-304 Food Texture and Rheology (3+0+0)

1. To understand the concepts of food rheology and food texture.
2. To depict rheological properties of foods and measuring methods.

Unit-I

Introduction to food rheology: Concept of rheology, elastic, plastic and viscous behaviour, viscoelasticity, rheological models and constitutive equations, Aerodynamic and hydrodynamic characteristics.

Unit-II

Rheology of chocolate: Basic concept of Newtonian and non Newtonian fluids, Casson body chocolate application, Factors affecting chocolate manufacturing

Unit-III

Food Texture: basic concept of food texture, Principles of determining food texture, Texture measurement instrument, Texture of food: compression, snapping-bending, cutting shear, puncture, penetration, texture profile analysis, dough testing instruments-farinograph and mixograph, extensograph and alveograph, amylograph.

Unit-IV

Textural attributes of fruits and vegetables, Textural attributes of pasta and baked products, Textural properties of meat and their instrumental measurement, Methods of texture evaluation, subjective and objective measurements.

Unit-V

Food Emulsions: Basic concept, Textural characteristics of food emulsion, Functions of emulsifier in relation to food texture

OUTCOMES:

No. of Lecture: 45

- Students will understand the importance of quality control and food packaging.
- Understand thermal processing of food and hygiene practices in food industry.

Books Recommended:

1. Bourne M.C. 2002. Food Texture and Viscosity: Concept and Measurement. Academic Press.
2. Steffe J.F. 1992. Rheology and Texture in Food Quality. AVI Publications.
3. Rao, M.A., Rizvi, S.S.H. and Datta A.K. 2005. Engineering properties of foods: CRC Press.
4. Faridi, H and Faubion, J.M. 1997. Dough Rheology and Baked Products: CBS Publication, New Delhi.



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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)

Semester-VI

FT-306 Plantation Products and Spices Technology (3+0+0)

OBJECTIVES:

To enable the students to understand about

- Coffee and its processing techniques, instant coffee, and quality grading
- Different types of tea and its manufacturing techniques, instant tea, quality parameters of tea

Unit- I

Production and processing of coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee. Quality grading of coffee.

Unit -II

Tea: Occurrence, chemistry of constituents, types of tea – green, oolong and ctc, chemistry and technology of CTC tea, manufacturing process, Green tea manufacture, Instant tea manufacture, Grading of tea

Unit- III

Production, processing and chemical composition of cocoa beans. Cocoa Processes: Cleaning,roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocopowder. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering,Moulding.

Unit -IV

Major spices: Pepper, Cardamom, ginger and turmeric, Oleoresins and essential oils, Method of manufacture, Chemistry of the volatiles, Enzymatic synthesis of flavour identical, Quality control

Unit- V

Minor spices: Cumin, Coriander, Cinnamon, fenugreek, Garlic, Clove and Vanilla, Oleoresins and essential oils, Method of manufacture, Chemistry of the volatiles, Quality control, Present trends in synthesis of volatiles.

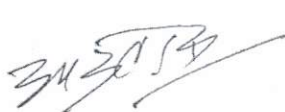
OUTCOMES:

No. of Lecture : 45

- On completion of the subject, students will be able to understand the processing steps involved for different plantation products and spices.

Books Recommended:

1. Salunkhe, D.K. and Kadam S.S. Ed. 1998. Hand book of Vegetable Science and Technology, Marcel Dekker, New York, USA.
2. Chocolate, Cocoa and Confectionery Technology, Minifie Bernard W., III Edition, Aspen Publication, 1999.
3. Handbook on Spices, National Institute of Industrial Research (NIIR) Board, Asia Pacific Business Press Inc., New Delhi 2004.



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1.4.2023



B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VI
FT-308 Food Process Equipment Design (3+0+0)

OBJECTIVE:

- To understand the construction requirements, process design, fabrication and installation of equipments and to enhance the knowledge in the design of food processing equipments.

Unit-1

Introduction: Design and selection criteria for process equipment. Stresses created due to static and dynamic loads, design stress, elastic instability, combined stresses and theories of failure, brittle fracture, creep, temperature effects, radiation effects, effects of fabrication methods.

Unit-II

Design of Material Handling and Equipment

Belt Conveyor : Design, maximum length of belt in open and cross belt, diameter and speed of pulley, slip, thickness of belt, tension in slack side and tight side, to find horse power required to operate the belt conveyor, design of bucket elevator.

Chain conveyor: Number of teeth and length of chain for chain conveyor, horsepower required type of chain conveyor thermal power requirement of the trolley, scrapes, Screw Conveyor: Its importance and various uses in food industry, design factor.

Pneumatic conveyor: Importance in food industry, design considerations. Design of pneumatic conveyor.

Unit-III

Dryers: Structural and thermal design, selection of dryer.

Pressure Vessel Design: Introduction, Operating Conditions, Design conditions and stress, Design of shell and its component, Stresses from local load and thermal gradient, Design problems.

Unit-IV

Heat Exchanger: Design of heat exchanges, functional difference between plate and tube heat exchangers, calculation of maximum area required, overall heat transfer coefficient for milk and water, design considerations for heat exchangers.

OUTCOME:

No. of Lecture : 45

- Ability to design, fabricate and operate processing equipments .

Books Recommended:

1. Process Equipment Design by Joshi MV and Mahajani VV. Macmillan India Ltd.
2. Process Equipment Design by Brownell and Young. John Willey.
3. Process Equipment Design by Bhattacharya BC. Macmillan India Ltd.
4. Strength and Elasticity of Materials by Brooks WH. Asia Publishing House.

 
1.4.2023

B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VI
FT-310 Technology of Fats and Oils (3+1+0)

OBJECTIVES:

- The course aims to develop the knowledge of students in the area of Fat and Oil processing.
- To appreciate the application of scientific principles in the processing

Unit- I:

Physical and chemical properties: Sources of vegetable oils, production status-oil content – coconut, palm, peanut, rice bran, sesame, mustard and sunflower seeds oil – physical and chemical properties of fats and oils, chemical reactions of oil, hydrolysis, hydrogenation, oxidation and polymerization.

Unit- II:

Extraction methods: Oil extraction methods: mechanical expression, ghani, power ghani, rotary, hydraulic press, screw press, expellers, filter press - principle of operation and maintenance, solvent extraction Process – steps involved, batch and continuous-continuous solvent extraction process for rice Bran, soybean and sunflower-oil, extraction process for groundnut and cotton seed, Production of special oils – palm oil, virgin coconut oil – extraction process.

Unit -III:

Refining of Oils: Refining of oils: objectives, characterization, degumming, zeneath process, deacidification Process, continuous acid refining, bleaching of oil, continuous bleaching process decolorizing agents, deodorization process, winterization processes, hydrogenation of oil batch type hydrogenation, production process of vanaspati, ghee and margarine, special fats, butter, partial sterilization, emulsification, chilling, kneading and rolling, incorporation of salt, colouring substances.

Unit -IV:

Packaging of edible oils: Packaging of edible oils requirements, types – tinplate, semi rigid, glass, Polyethylene Terephthalate, Poly Vinyl Chloride, flexible pouches – packaging for vanaspati and ghee changes during storage of oil – rancidity – causes – atmospheric oxidation and enzyme action – free fatty acid – colour-non edible oils – castor oil, linseed oil, vegetable waxes – production and processing.

Unit V: Industrial applications and quality standards

Industrial applications of fats and oils – quality regulations - manufacture of soap, candle, paints and varnishes - ISI and Agmark standards – site selection for oil extraction plant

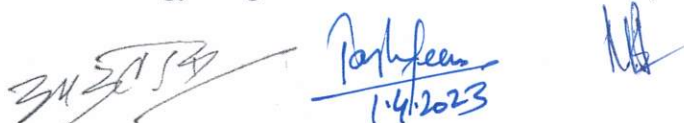
OUTCOMES:

No. of Lecture: 45

- Be able to understand and identify the specific processing technologies used for Fats and oils
- Understand the application of scientific principles in the processing technologies.

Books Recommended:

1. Harry Lawson.1997. Food oils and Fats, Technology, Utilization and Nutrition. CBS.
2. Weiss, T.J. 1970. Food Oils and their uses. The AVI Publishing Company, Inc. Westport.
3. Acharia, K.T.1990. Oil seeds and oil milling in India. Oxford and IBH publ., New Delhi.
4. Panda, H. 2000. Essential oils-Hand book- ISBN, New Delhi.
5. Anonymous. 2004. Handbook of oils, fats and derivatives with refining and packaging technology. Engineers India Research Institute, New Delhi.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VI

FT-312 Food Processing Waste Management (3+0+0)

OBJECTIVES:

To impart knowledge of wastes and by-products of food processing, their effects on the quality of environment and to minimize the production of wastes and food processing waste management.

Unit – I

Food Industry Wastes and Environmental Pollution: Characterization of food industry effluents, Physical and chemical parameters, Oxygen demands and their interrelationships; Residues (solids), fats, oils and grease; Forms of nitrogen, sulphur and phosphorus, anions and cations, surfactants, colour, odor, taste and toxicity; Unit concept of treatment of food industry effluents, screening, sedimentation /floatation as pre-and primary reactants.

Unit – II

Food Industry By-products and their Utilization: Characterization and utilization of by-products from cereals, pulses, oilseeds, fruits, vegetables, plantation crops, fermented foods, milk, fish, meat, egg and poultry processing industries. *Case study:* Advanced technologies for effluent treatment in food industry in India: Dairy Industry, Fruits & Vegetables processing Industry & Meat Processing Industry

Unit – III

Biological Oxidation: Objectives, Organisms involved, Reactions, Oxygen requirements, Aeration device systems: Lagoon, Activated sludge process, Oxidation ditch, Rotating biological contactor-variations and advanced modifications

Unit – IV

Waste Water Management: Wastewater treatment systems, Physical separations, Micro-strainers, Filters, Ultra filtration and reverse osmosis; Physico-chemical separations- activated carbon adsorption, ion-exchange, electro dialysis and magnetic separation; Chemical oxidation and treatment-coagulation and flocculation, disinfection; Handling disposal of sludge.

Unit – V

Standards and Acts: Food industry wastes, Food waste treatment-ISO 14001 standards, Standards for emission or discharge of environmental pollutants from food processing industries according to Environment (Protection) Act 1986, Elements of importance in the efficient management of food processing wastes.

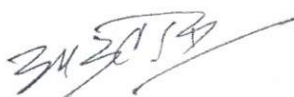
OUTCOMES:

No of Lecture: 45

- Awareness of Importance in treating waste product from food industry.
- Knowledge of Treatment methods and recycling of waste product from food industry

Reference Books

1. Lawrence K. W., Howard, H. Y. and Yapijakis, C. 2005. Waste Treatment in the Food Processing Industry, CRC Press, New York.
2. Loannis, P. and Arvanitoyannis, S. 2008. Waste Management for the Food Industries, Elsevier Publishers, New York.
3. M.N. Rao and A.K. Datta. 2008. Waste Water Treatment, Oxford and IBH Publishing Co Pvt.Ltd, New Delhi.
4. Metcalf, P. and Eddy, L. 2013. Wastewater Engineering Treatment and Resource Recovery, 5th Edition, McGraw Hill Publication, New York.
5. Wang, C. and Taylor, Lo H. 2006. Waste Treatment in the Food Processing Industry, CRC Press, New York.



Rohit
14.2.2023



B.Tech. (Food Processing and Technology)
(Effective from 2023 Onward)
Semester-VI
FT-314 Technology of Frozen Foods (3+0+0)

OBJECTIVES:

- To understand the underlying principles of operation in different Refrigeration & cold storage systems and its components.
- To provide knowledge on design aspects of cold storage systems

Unit – I

Fundamentals of Freezing: Glass transitions in frozen foods and biomaterials, Microbiology of frozen foods, Thermophysical properties of frozen foods, Freezing loads and Freezing time calculation, Innovations in freezing process

Unit – II

Facilities for the Cold Chain: Freezing methods and equipment, Cold store design and maintenance, Transportation of frozen foods, Retail display equipment and management, Household refrigerators and freezers, Monitoring and control of the cold chain.

Unit – III

Quality and Safety of Frozen Foods: Quality and safety of frozen meat and meat product, Quality and safety of frozen poultry and poultry products, Safety and quality of frozen fish, Shellfish, and related products, Quality and safety of frozen vegetables, Quality and safety of frozen fruits, Quality and safety of frozen dairy products, Quality and safety of frozen ready meads, Quality and safety of frozen bakery products, Quality and safety of frozen eggs and egg products

Unit – IV

Monitoring and Measuring Techniques for Quality and Safety: Chemical Measurements, Sensory analysis of frozen foods, Food borne illnesses and detection of pathogenic microorganisms, Shelf-life prediction of frozen foods.

Packaging of Frozen Foods: Introduction to frozen food packaging, Plastic packaging of frozen foods, Paper and card packaging of frozen foods, Packaging of frozen foods with other materials, Packaging machinery.

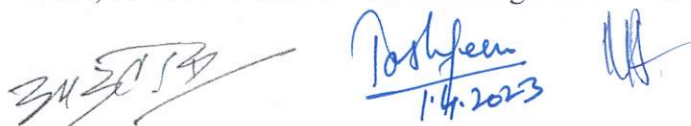
OUTCOME

No. of Lecture:45

- Upon completion of this course, the students will be able to demonstrate the operations in different Refrigeration & cold storage systems and also able to design Refrigeration & cold storage systems.

Reference Books

1. Quality in Frozen Foods by Marilyn C. Erickson, Yen-Con Hung
2. Handbook of Frozen by Isabel Guerrero Legaretta
3. Managing Frozen Foods by Managing Frozen Foods
4. Stringer, Mike and C. Dennis. "Chilled Foods: A Comprehensive Guide". 2nd Edition, CRC / Woodhead Publishing, 2002.
5. Kennedy, Christopher J. "Managing Frozen Foods". CRC / Woodhead Publishing, 2000.
6. James, S.J. and C. James. "Meat Refrigeration". CRC / Woodhead Publishing, 2002


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT-401 Bakery and Confectionery Technology (3+0+0)

OBJECTIVES:

This course will enable the student to

- Familiarize with the commercial methods of baking bread and recent advances in bakery industry
- Learn microbiological aspects of bakery products, sanitation and hygiene of baking industries.

Unit-I

Status of bakery food in India and abroad, Materials for baking: Wheat flour and wheat flour treatments: Grade of flour, constituents of flour – ageing of flour – Tests for flour quality. Yeast: types of yeast, yeast characteristics, Preparation, Handling & Storage, Adequacy for use in bakery industry. Shortenings: types and role of shortenings, Emulsifiers and antioxidants: types and their roles, Sweeteners used in bakery, Technology and quality parameters for baked products: Bread, Biscuits and cakes.

Unit-II

Bakery equipment and machinery: Different types of Mixers, kneaders and cutters. Different types of ovens. Packaging machinery for bread and biscuits. Quality control in bakery industry. Quality control of raw materials. Quality control of finished products. Quality control of packaging materials.

Unit-III Technology of bread making Different methods

Process steps and their significance. Characteristics of good bread. Defects in bread their causes and remedies.

Unit-IV Technology of Cakes Manufacture

Different cake making processes. Sugar batter method, Flour batter method, Modified sugar batter method Whipping method, Blending method etc. Process steps and their significance. Importance of baking time and temperature. Recipe balancing .Defects in cakes, their causes and remedies.

UNIT-V Biscuits

Definition and types. Fermented dough biscuits. Cookies. Types of cookies and their manufacture. Cream biscuits. Process steps and their significance. Defects in biscuits their causes and remedies.

OUTCOMES

No. of Lecture : 45

- Better understanding of process technology of bakery and confectionery products
- Use of sanitation and safety practices in bakery and confectionery production

Reference Books

1. E.J Pyler: Baking Science and Technology: Vol.1 & 2, 3rd Edition, Sosland, 1988
2. Samuel A.Matz: Bakery Technology and Engineering, Springer US
3. Samuel A.Matz: Cookie and Cracker technology, AVI Publications
4. H. Faridi:The Science of Cookie and Cracker Production, CBS Publishers & Distributors, N Delhi

B.Tech. (Food Processing and Technology)

(Effective from 2023 onward)

Semester-VII

FT-403 Food Storage Engineering (3+0+0)

OBJECTIVES:

The course aims to develop the knowledge of students in the area of Food storage

- This is necessary for effective understanding specific aspects of food storage

Unit-I

Storage losses in agricultural commodities. Grain Storage: levels of storage, Physical properties of grain affecting storability, Factors of spoilage. Storage entomology, fungi and mycotoxins, Treatments for enhancing shelf life, Rural storage structures, Design considerations of bulk storage structures - Grain pressure theories. Air distribution system and aeration fans.

Unit-II

Frozen storage : Quality loses in frozen foods- Physical changes, Chemical changes in food components, Nutritional aspects of freezing, Microbiology of frozen products, Glass transitions temperature and stability of frozen foods, Temperature requirements during frozen storage, Shelf-life of frozen foods- shelf-life testing, Modelling loss of quality in frozen foods, Time-Temperature integrators, Packaging of frozen foods, Different types of freezers.

Unit-III

Controlled atmospheric storage: Biochemical considerations of CAS, Gas exchange mechanisms, Mass balance principles, Gas generators, Equipment's for producing and regulating controlled atmosphere, Design of controlled atmosphere storage chambers. **Modified atmospheric storage**: Overview of Modified atmospheric storage, Gases and Vapor applied to modified atmosphere processing operations, MAP modelling- Kinetics of food deteriorative reactions, Shelf-life testing, Enzyme kinetics applied to MAP, MAP design with oxygen modelling .

Unit-IV

Hypobaric storage: History of Hypobaric storage, Experimental errors in hypobaric storage research, Gas and vapor mass transfer at low pressure, Requirements for installation-measurement devices (Relative humidity, Pressure, Air-change rate, Oxygen, Carbon dioxide, Ethyl alcohol, Acetaldehyde, hypobaric acid vapor), Flow control, Humidity control, Effects on food, Effects on microbes.

OUTCOMES

No. of Lecture : 45

- On completion of the course the students are expected to Understand the application of scientific principles in the processing technologies specific to the materials.

Reference Books

2. Hypobaric storage in food industry- Advances in technology and theory"- Stanley.P.Berg
3. Frozen food science and Technology"- Judith.A.Evans
4. Engineering for storage of fruits and vegetables"- Chandra Gopala Rao FD8022
5. Shejbal, J. (ed) 1980. Controlled atmosphere storage of grains. Elsevier Scientific Publishing Co. London.
6. Sahay K.M and K.K.Singh. "Unit Operations of Agricultural Processing" Vikas Publications, New Delhi, ISBN-81-259-1142-1, 2007.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII

FT 417 - Food Safety, Quality and Regulation (3+0+0)

OBJECTIVES:

- To characterize different type of food hazards, physical, chemical and biological in the industry and food service establishments
- To help become skilled in systems for food safety surveillance
- To be aware of the regulatory and statutory bodies in India and the world

Unit-I

Introduction to food safety and security: Hygienic design of food plants and equipments, Food Contaminants (Microbial, Chemical, Physical), Food Adulteration (Common adulterants), Food Additives (functional role, safety issues), Food Packaging & labeling. Sanitation in warehousing, storage, shipping, receiving, containers and packaging materials. Control of rats, rodents, mice, birds, insects and microbes. Cleaning and Disinfection, ISO 22000 – Importance and Implementation

Unit- II

Food quality: Various Quality attributes of food, Instrumental, chemical and microbial Quality control. Sensory evaluation of food and statistical analysis. Water quality and other utilities.

Unit-III

Critical Quality control point in different stages of production including raw materials and processing materials. Food Quality and Quality control including the HACCP system. Food inspection and Food Law, Risk assessment – microbial risk assessment, dose response and exposure response modelling, risk management, implementation of food surveillance system to monitor food safety, risk communication

Unit- IV

Indian and global regulations: FAO in India, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection Convention (IPPC)

Unit- V

Codex Alimentarius Commission - Codex India – Role of Codex Contact point, National Codex contact point (NCCP), National Codex Committee of India – ToR, Functions, Shadow Committees etc.

OUTCOMES:

No. of Lecture : 45

- Thorough Knowledge of food hazards, physical, chemical and biological in the industry and food service establishments
- Awareness on regulatory and statutory bodies in India and the world

Reference Books

1. Handbook of food toxicology by S. S. Deshpande, 2002
2. The food safety information handbook by Cynthia A. Robert, 2009
3. Nutritional and safety aspects of food processing by Tannenbaum SR, Marcel Dekker Inc., New York 1979
4. Microbiological safety of Food by Hobbs BC, 1973
5. Food Safety Handbook by Ronald H. Schmidt, Gary E. Rodrick, A John Wiley & Sons Publication, 2003.


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT- 409 Food Dehydration Technology (3+0+0)

OBJECTIVES:

To explain the dehydration, drying curve, freeze drying and equipments required for carrying out these operations.

Unit I

Principles of drying– Fundamentals of air-water mixtures – psychrometric chart – Heat and mass transfer in ideal dryers – with and without recirculation. Theories of drying – constant and falling rate period - diffusion theory, capillary theory, evaporation – condensation theory, Luikov, Philip and De Vries theory. Water content in foods and its determination – Theoretical and empirical models for determining water activity

Unit II

Fundamentals of cabinet drying – Mass and Heat balances in dryers (batch and continuous) (simple problems only) – description of batch and continuous dryers – Application in Food industry – Vacuum and Drum driers

Unit III

Fundamentals –Nozzles, Rotary atomizers and two fluid feeds- Interaction of droplets with air- Drying of droplets with soluble and insoluble solids – Microstructure of spray dried products – Reconstitution – Foam spray drying – Applications in the Food industry

Unit IV

Fundamentals of freeze drying – Freezing and drying steps – Combined heat and mass transfer (only theory) – Structural changes and volatile retention during freeze drying - Freeze dehydration related processes :prefreezing, preconcentration, condensation, defrosting – Industrial freeze driers – Atmospheric freeze drying - Applications in food industry.

Unit V

Fluidised bed drying – Batch and Continuous dryers – Pneumatic dryers, Extrusion cooking – Single and Twin-screw extruders Packaging of dehydrated products

OUTCOMES:

No. of Lecture : 45

Able to understand the principle and application of dehydration and freezing.

Reference Books

1. Dehydration of Foods by Gustavo V. Barbosa –Cánovas and Vega-Mercado
2. Food Drying Science and Technology, Microbiology, Chemistry, Application, by Y. H. Hui
3. Handbook of Industrial Drying, Arun S. Mujumdar.



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1.24.2023



B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT-411 Meat, Fish and Poultry Processing Technology

OBJECTIVES:

- The course aims to develop the knowledge of students in the area of animal product processing and technology.
- This course will enable students to appreciate the application of scientific principles in the processing of these materials.

UNIT I

Status of meat processing in India and abroad, recent trends in meat processing. Types of Meat and its sources, composition, structure, of meat and meat products. Ante mortem handling, slaughtering of animals, Mechanical deboning, inspection and grading of meat. Post-mortem changes of meat: PSE and DFD conditions of meat. Color, flavors, microbiology and spoilage factors of meat and meat products.

UNIT II

Meat Processing: Factors affecting post-mortem changes, properties and shelf-life of meat. Meat tenderization and Meat quality evaluation. Modern abattoirs, slaughter house and its features. Preservation of meat aging, pickling, smoking. Dried and Cured meat. Canned meat, Frozen meat, Cooked and Refrigerated meat, Sausages.

UNIT III

Fish Processing: Types of fish, composition, structure and spoilage factors of fish. Post-mortem changes in fish. Handling and transportation of fish. Bacteriology of fish, Chilling of fish, Freezing and Individual quick freezing. Canning and smoking operations, Salting and drying of fish, pickling. Radiation processing of fish and fish products. Seafood quality Assurance, Advances in fishery by products technology.

UNIT IV

Poultry: Introduction, Types and characteristics of poultry products, composition, nutritive value, calculation of nutritive value of poultry products. Unit operation involved in poultry processing.

Egg processing: structure, composition, nutritive value, calculation of nutritive value and functional properties of eggs, Factor affecting egg quality and measures of egg quality. Preservation of egg by different methods. Egg powder processing.

OUTCOME:



No. of Lecture: 45

On completion of the course the students are expected to

- Be able to understand and identify the specific processing technologies used for meat and such foods and the various products derived from these materials.
- Grasp the changes in the composition of foods with respect to the type of processing technology used.

Reference Books

1. Govindan. T.K, "Fish Processing Technology", Oxford and IBH Publishers, New Delhi, 1985.
2. Lawrie, R.A. "Meat Science", Second Edition. Pergamon Press, Oxford, UK. 1975.
3. Stadelmen, W.J. and Cotterill, O.J., "Egg Science and Technology", Second Edition, AVI, Westport, 1977. ty of Chemistry, 2003.

B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT-413 Functional Foods and Nutraceuticals (3+1+0)

Objectives:

- To understand the basic concepts of nutraceuticals and functional food.
- To understand the role of nutraceuticals and functional food in human health.

Unit I

Introduction and significance: Introduction to Functional Foods and Nutraceuticals: Definition, History and Classification and their health benefits. Dietary supplements, fortified foods, functional foods and phytonutraceuticals. Scope involved in the industry, Indian and global scenario.

Unit II

Properties, structure and functions of various Nutraceuticals: Antioxidants and other compounds (isoflavones, β -Carotene, lycopenes), its role as nutraceuticals and functional foods. Dietary fibers as functional food ingredients. Different beverages (Coffee, tea and other beverages) as functional foods/drinks .

Unit III

Food as remedies: Nutraceuticals bridging the gap between food and drug, Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Arthritis, circulatory problems, hypoglycemia, Osteoporosis.

Unit IV

Introduction to Probiotics and Prebiotics: Health effects of probiotic microorganisms, Probiotics in various foods, Quality Assurance of probiotics and safety. Introduction to anti-nutritional factors. Marketing and regulatory issues for functional foods and nutraceuticals. Modern trends in nutraceutical and functional foods. Safety issues, Health Claims, regulations and safety issues- International and national.

Outcomes:

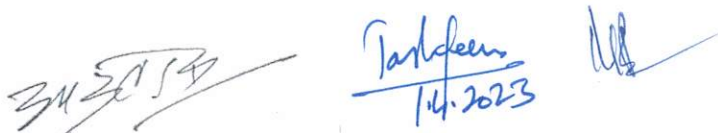
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After studying this course, the student shall be able to describe:

- What are functional foods and nutraceuticals, classify the functional foods,
- Discuss the potential health benefits of functional foods.
- Discuss the industrial applications of functional foods.

Books Recommended:

1. Bisset, N. G. and Max W. H. (2001). Herbal Drugs and Phytopharmaceuticals, II Edition, CRC.
2. Gibson, G. R. and Williams, M. C. (2001). Functional Foods Concept to Product. CRC Press.
3. Gupta, R. C. (2016). Nutraceuticals: Efficacy, Safety and Toxicity. Academic Press.
4. Tipnis, H.P. (1996). Bioavailability and Bioequivalence: An Update, New Age International.
5. Vattem, D.A. and Maitin V.(2016). Functional Foods, Nutraceuticals and Natural Products, Concepts and Applications. DEStech Publications, Inc.
6. Webb, P P. (2006). Dietary Supplements and Functional Foods. Blackwell.
7. Wildman, R. (2006). Handbook of Nutraceuticals and Functional Foods. CRC.
8. Wildman, R. E. (2016). Handbook of Nutraceuticals and Functional Foods. CRC Press


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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT- 415 Flavour Technology (3+1+0)

OBJECTIVES:

- To understand the flavour compounds involved in development of flavor
- To understand the analytical techniques involved in flavor analysis

UNIT I

Olfactory perception of flavour and taste-Theories of olfaction-Molecular structure and activity relationships of taste-Sweet, bitter, acid and salt, chemicals causing pungency, astringency, cooling effect, -properties. Problems in flavour research – classification of food flavours; chemical compounds responsible for flavour.

UNIT II

Classification: Alliaceous flavours-Bittering agents, Coffee and Cocoa, Fruit flavours
Flavour compounds: Chemical compound classes and their flavour responses; flavour development during biogenesis, flavour development during food processing; Effect of roasting, cooking, and frying on flavour developments. Use of biotechnology to develop flavours.

UNIT III

The chemical senses anatomy of the chemical senses; neural development of the chemical senses; receptor mechanisms, neural coding; the control of eating.

UNIT IV

Flavour analysis: Subjective versus Objective methods of analysis; psychophysics and sensory evaluation and its types, ENOSE, ETONGUE; Instrumental analysis; sample handling and artifacts; data handling

UNIT V

Teaching flavour concepts: Problem based learning; tongue and nose; Onion-Beverage-Maillard reaction-Thio-stench

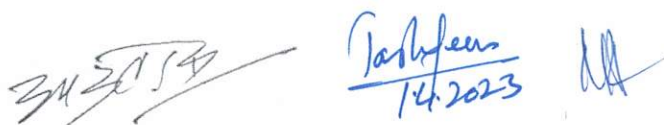
OUTCOMES:

No of Lecture: 60

- Better understanding and knowledge of contribution of different compounds for the development of flavor and Analytical techniques involved in flavor analysis.

Reference Books

1. Fisher, Carolyn and Thomas R. Scott. "Food Flavours: Biology and Chemistry". The Royal Society of Chemistry, 1997.
2. Heath, H.B. and G. Reineccius. "Flavor Chemistry and Technology". CBS Publishers, 1996.
3. Reineccius, Gary. "Flavor Chemistry and Technology". II Edition, Taylor & Francis, 2006.
4. Shahidi, Fereidoon and Chi-Tang Ho. "Flavor Chemistry of Ethnic Foods". Kluwer Academic / Plenum, 1999.
5. Ashurst, Philip R. "Food Flavorings". III Edition, Aspen Publication

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B. Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VII
FT-405 Dairy Process Technology (3-0-0)

OBJECTIVE

- To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products, sanitation and effluent treatment in dairy industry

UNIT-I

Current status of Indian dairy sector: production, utilization and per capita consumption of milk, SWOT analysis of dairy industry; Milk: definition, types of milk, composition, nutritive value of milk and milk products; Physico-chemical properties of milk, Milk processing: reception, pasteurization (LTLT, HTST), homogenization, standardization, sterilization, UHT processing.

UNIT-II

Cream separation and related equipments; Butter: definition, butter-making process, overrun, defects in cream & butter; Technology of ice-cream: composition of ice-cream, methods of preparation.

UNIT-III

Evaporated and concentrated milks: methods of manufacture and defects. Dried milks: dried whole milk/WMP, dried non-fat milk/SMP; milk drying system (film, roller, drum, spray, foam spray drying).

UNIT-IV

Cleaning and disinfection in a dairy industry: terms, definitions, cleaning and disinfection agents and processes; cleaning in place (CIP) and cleaning out of place (COP).

OUTCOME:

No. of Lecture: 45

The students will gain knowledge about dairy processing and understand the manufacturing processes of various dairy products

Books Recommended:

1. Sukumar De (1977) Outlines of Dairy Technology, Oxford University Press.
2. Smit G. (2003) Dairy processing - improving quality, Woodhead Publishing.
3. Hohnson M. and Alford (1987) Fundamentals of dairy chemistry. 2nd edition, CBS Publishers.
4. Rajagopal, Roy, S.K. (2014) Milk & milk products technology, BS Publishers.
5. Early R. (2010) Technology of dairy product, Springer Publishers.
6. Ahmed, Tufail (1997) "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad.
7. Kessler, H.G. (1981) "Food Engineering and Dairy Technology", V.A. Kessler, Frcising., Germany.
8. Vaclavik V. A. & Christian E. W. (2003) Essentials of food science. 2nd edition, Springer International.
9. Spreer E. (1998) Milk and dairy product technology, Marcel Dekker Inc.

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B.Tech. (Food Processing and Technology)
(Effective from 2023 onward)
Semester-VIII

FT-454

Project II

(20 Credits)

**MOOCS courses/Seminar/
Workshop/Research Ethics
/Area Specific case study**

(Open elective) OE4 (3 Credits)

