Revised

Syllabus

of

B. Voc. in Food Processing and Technology

Centre of Food Technology

Institute of Professional Studies

University of Allahabad

Revised Course Structure of B.Voc. in Food Processing & Technology

Semesters	Paper Code		Title of Paper	Skill/ General Education Courses	Credits			
					L	T	P	Total
Sem I	**FFT 121**		Introduction to Food Processing	Skill	3	0	2	5
	FFT 122		Food Science	Skill	3	0	1	4
	FFT 123		Introduction to Food Microbiology	Skill	3	0	2	5
	FFT 124		Food Hygiene and Sanitation	Skill	2	0	2	4
	FFT 101		Communication and Documentation Skills	Gen Ed.	4	0	2	6
	ELECTIVE-I (Any One)	**FFT 151**	Applied Mathematics	Gen Ed.	3	3	0	6
		FFT 152	Introduction to Biosciences					
	QP-FIC/Q5003		Plant Biscuit Production Specialist	NSQF-4				*
			TOTAL		**18**	**3**	**9**	**30**
Sem II	**FFT 125**		Food Processing Equipments	Skill	3	0	1	4
	FFT 126		Technology of Processed and Preserved Foods	Skill	2	0	2	4
	FFT 127		Introduction to Food Quality Management	Skill	2	0	1	3
	FFT 128		Food Quality and Analysis- I	Skill	3	0	2	5
	FFT 102		Environmental Studies-I	Gen Ed.	3	0	2	5
	FFT 103		Financial Accounting	Gen Ed.	3	0	0	3
	FFT 104		Introduction to Computer Application	Gen Ed.	3	0	1	4
	FFT 130		Industrial Training-I for 15 days	Skill	0	0	2	2
	QP-FIC/Q5001		Plant Baker	NSQF-5				*
			TOTAL		**19**	**0**	**11**	**30**
Sem III	**FFT 221**		Unit Operations in Food Processing	Skill	2	1	0	3
	FFT 222		Basic Food Chemistry	Skill	2	0	2	4
	FFT 223		Food Quality and Analysis- II	Skill	2	0	2	4
	FFT 224		Cereals, Pulses and Oilseed Technology	Skill	2	0	2	4
	FFT 225		Human Nutrition	Skill	3	1	0	4
	FFT 201		Crop Production: Concepts and Practices	Gen Ed.	2	0	0	2
	FFT 202		Food Business Management	Gen Ed.	3	0	0	3
	FFT 203		Communication Skills and Technical Writing	Gen Ed.	3	2	0	5
	FFT 204		Basic Concepts in Laboratory Techniques	Gen Ed.	0	0	1	1
			TOTAL		**19**	**4**	**7**	**30**
Sem IV	**FFT 226**		Fruits and Vegetable Technology	Skill	2	0	2	4
	FFT 227		Introduction to Food Packaging	Skill	2	0	1	3
	FFT 228		Dairy Technology	Skill	2	0	1	3
	ELECTIVE-II (Any One)	**FFT 251**	Technology of Meat, Fish and Poultry	Skill	2	0	1	3
		FFT 252	Flavour Technology					
		FFT 253	Fermentation Technology					
	FFT 229		Bakery and Confectionery Products	Skill	2	0	1	3
	FFT 205		Environmental Studies - II	Gen Ed.	3	1	0	4
	FFT 206		General Biochemistry	Gen Ed.	3	0	1	4
	FFT 207		Statistics and Data Analysis	Gen Ed.	2	2	0	4
	FFT 230		Industrial Training-II for 15 days	Skill	0	0	2	2
			TOTAL		**18**	**3**	**9**	**30**
Sem V	**FFT 321**		Principles of Food Engineering	Skill	1	2	1	4
	ELECTIVE-III (Any One)	**FFT 351**	Post Harvest Management of Fruits and Vegetables /	Skill	2	0	1	3
		FFT 352	Food Beverage Technology /	Skill				
		FFT 353	Technology of Indigenous milk Products	Skill				
		FFT 354	New Product Development and Sensory Science	Skill				
	FFT 322		Waste Management and Effluent Treatment	Skill	2	1	0	3
	FFT 323		Food Laws and Regulations	Skill	2	1	0	3
	FFT 324		Food Plant Design and Layout	Skill	2	1	0	3
	FFT 301		Disaster Management	Gen Ed.	2	1	0	3
	FFT 302		Food Storage and Logistic Management	Gen Ed.	3	0	0	3
	FFT 303		Introductory Biotechnology	Gen Ed.	2	0	1	3
	FFT 304		Agribusiness Management	Gen Ed.	2	1	0	3
	FFT 330		Seminar	Skill	0	0	2	2
			TOTAL		**18**	**7**	**5**	**30**
Sem VI	**FFT 325**		Quality Assurance and Certification	Skill	3	0	0	3
	FFT 305		Computer Applications in Food Technology	Gen Ed.	3	1	0	4
	FFT 306		Human Values and Ethics	Gen Ed.	3	0	0	3
	FFT 307		Project Management and Entrepreneurship	Gen Ed.	3	2	0	5
	FFT 340		Project Work for 3 months	Skill	0	0	15	15
			TOTAL		**12**	**3**	**15**	**30**
			G. TOTAL		**104**	**20**	**56**	**180**

*** Non-credit requirement; Qualification Pack (QP) as recommended by Sector Skill Council (FICSI).**

SEM-I

Skill Course FFT 121: Introduction to Food Processing

Credits: (3-0-4-5)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint with principles of different techniques used in processing and preservation of foods.

Course Content

UNIT I 5 lectures

Introduction: Definition and scope of Food Science and Technology, Sources of food, scope and benefit of industrial food preservation, perishable, non perishable food, causes of food spoilage.

UNIT II 15 lectures

Thermal processing methods of preservation: Principle: Canning, blanching, pasteurization, sterilization, evaporation.

Use of low temperature: Principle and effect on quality. Chilling, cold storage, freezing.

Preservation by drying dehydration and concentration: Principle, Methods and effect on quality.

Preservation by radiation: Definition, Methods of Irradiation, Direct & Indirect effect, measurement of radiation dose, dose distribution, effect on microorganisms.

UNIT III 5 lectures

Presentation of foods by Preservatives: chemicals, antioxidants, mould inhibiters, antibodies, acidulates etc.

Preservation by salt & sugar: Principle, Method and effect on food quality.

UNIT IV 5 lectures

Preservation by fermentation: Definition, Advantages, disadvantages.

UNIT V 15 lectures

Recent methods in preservation: Pulsed electric field processing, High pressure processing, processing using ultrasound, dielectric, ohmic and infrared heating.

Practical

- Introduction to food laboratory.
- To study the effect of enzymatic browning in fruits and vegetables.
- To study different types of blanching of fruits and vegetables.
- Preservation of food by canning.
- To perform cut out analysis of caned product.
- Preservation of food by high concentration of sugar i.e. jam.
- Preservation of food by high concentration of salt/acid i.e. pickle.
- Preservation of food by addition of chemicals i.e. tomato ketchup.
- Preservation of food by drying in a cabinet drier.
- Preservation of fruits & vegetables by freezing.
- Preservation of milk by pasteurization and sterilization.

Reference Books:

- Food Processing Technology by P.J.Fellows, Woodhead publishing ltd.
- Food Science by N.N. Potter, CBS publishing.
- Physical principles of Food Preservation. Vol. II by M. Karel, O.R. Fenema and D.B. Lurd, Maroel, Dekker Inc. New York.
- The technology of food preservation by N.W. Desrosier and J.N. Desrosier, CBS publishing.

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Skill Course FFT 122 : Food Science

Credits: (3-0-2-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To impart knowledge of various areas related to Food science and technology.

Course Content

UNIT I 14 lectures

Introduction to Food Science*:* Historical development of food science and technology, Evolution of Food Processing from prehistoric times till date, Introduction to various branches of Food Science and Technology

Cereals and Millets: Wheat- structure and composition, types (hard, soft/ strong, weak). Process of malting, Gelatinization of starch, types of browning. Rice- Composition of rice obtained by different dehusking methods, parboiling of rice- advantages and disadvantages. Millets -Varieties, composition and uses of maize, sorghum, barley, rye, oats, triticale, pearl millet and finger millet.

Pulses: Introduction, common names and scientific names of different pulses. Chemical composition of pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation. Toxic constituents in pulses and its detoxification processes.

UNIT II 6 lectures

Fats and Oils: Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, and hydrogenation. Rancidity - hydrolytic and oxidative rancidity and its prevention. Definition margarine, butter, hydrogenated vegetable oil, lard.

UNIT III 8 lectures

Fruits and Vegetables: Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments. Post harvest changes in fruits and vegetables – Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes during the storage of fruits and vegetables.

UNIT IV 12 lectures

Flesh Foods - Meat, Fish, Poultry: Meat - Definition of carcass, composition of meat, concept of red meat and white meat. Fish - Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish, spoilage of fish. Poultry - Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality.

Milk and Milk Products: Definition of milk, typical chemical composition of milk of different species i.e. buffalo, cow, goat. Composition of milk, its constituents, various steps in processing of milk. An overview of types of market milk and milk products-cheese, paneer, ice cream, ghee, butter, flavoured milk, imitation milk.

Condiments and spices: Composition and importance of spices.

UNIT V 5 lectures

Sensory evaluation of food: Objectives, type of food panels, characteristics of panel member, layout of sensory evaluation laboratory, sensitivity tests, threshold value, paired comparison test, duo-trio test, triangle test, hedonic scale, chemical dimension of basic tastes.

Practical

- To study the gelatinization temperature range and % sag of various cereal starches.
- To study the factors affecting gelatinization of cereal starches.
- To study germination of whole pulses and legumes.
- To study fermentation in cereals and pulses.
- To study non-enzymatic browning; caramelization in various sugars.
- To detect the adulteration in fats and oils by qualitative tests.
- To detect the presence of adulterants in milk.
- To perform the recognition test for the four basic tastes.
- To perform the sensitivity / threshold tests for four basic tastes.
- To recognize few odors and to learn to memorize them.

Reference Books:

- Food Science by B. Srilakshmi, publishing, New Age International (P) ltd. publications.
- Food Science by N.N. Potter, CBS publishing.
- Food Science by S. Manay, New Age International (P) ltd. publications.

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Skill Course FFT 123 : Introduction to Food Microbiology

Credits: (3-0-4-5)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint with different groups of micro-organisms associated with food, their activities, destruction and detection in food.

Course Content

UNIT I 10 lectures

Introduction of microbiology, History and significance of food microbiology.

Classification of microbes, Structure of microbes, Metabolism of microbes.

UNIT II 5 lectures

Environmental microbiology: microbiology of air and water.

UNIT III 5 lectures

Food contamination and public health: food poisoning

UNIT IV 15 lectures

Food microbiology and spoilage of fruits and vegetables, milk and milk products, cereals and cereal products.

Industrial microbiology: Industrial application of microbes.

UNIT V 10 lectures

Thermal inactivation of microbes: pasteurization, sterilization etc. concept of TDT, F, Z and D values. Factors affecting heat resistance.

Antimicrobial agents: mechanism and action

Practical

- An introduction to microbiology, aseptic technique and safety.
- Preparation of culture media.
- To sterilize the media and equipment.
- To prepare serial dilutions.
- Plating techniques
- Culturing the bacteria on a solid media by using serial dilution method and determining the number of viable cells in the culture (standard plate count).
- Introduction to microscopy and to study cell morphology with simple staining.
- To study cell morphology and cell arrangement with negative stain.
- To stain bacteria with gram stain.
- To stain bacterial cells by wet-mount technique to check the mobility (flagellin) in bacterial cell.
- To stain bacterial cells with malachite green stain to check the presence of endospore.

Reference Books:

- Food microbiology by V. Ramesh, MJP publishing.
- Food microbiology by W.C. Frazier, Ist Edition by Mcgraw Hill Pub. Co. New York.
- Modern Food Microbiology, J.M. Jay. CBS publisher.

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Skill Course: FFT 124 Food Hygiene and Sanitation

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

The knowledge and skills required to produce healthy meals for the family with regard to safety, effective organisation and management of family resources, and the needs and lifestyles of family members

Course Content

UNIT I 2 lectures

Principles of hygiene and its relation to food preparation.

UNIT II 8 lectures

General hygienic and sanitary practices to be followed by different food business operators - fruits and vegetable, milk and milk product, meat and meat product, catering etc.

UNIT III 10 lectures

General hygienic and sanitary requirements for different areas - location and surroundings, layout and design of food establishment premises, equipment & containers, facilities, food operations and controls, management and supervision, food testing facilities, audit, documentation and records, sanitation and maintenance of establishment premises, personal hygiene, product information and consumer awareness, training.

UNIT IV 5 lectures

Water quality - water standards and analysis of physical, chemical and microbiological characteristics of water.

UNIT V 5 lectures

Waste treatment - fundamentals of physical, biological & chemical waste treatments.

Practical

- Analysis of water used in food industries
  - Determination of acidity of the given sample of water.
  - Determination of alkalinity of the given sample of water.
  - Determination of the total hardness of Water.
  - Determination of pH of the given sample of Water.
  - Determination of Conductivity of the given sample of Water.
  - Determination of Total Solids of the given sample of Water.
  - Determination of Total Dissolved Solids of the given sample of Water.
  - Determination of Turbidity of the given sample of Water.
- Assessment of surface sterilization using swab and rinse method.
- Case Study of food hygiene and sanitation (GMP/GHP) of a food industry.
- Preparation of HACCP Plan

Reference Books:

- Food plant sanitation – Packer and Litchfield (Reinhold Publ.)
- Handbook of analysis and quality control for fruits and vegetables products by S. Ranganna, Mcgraw Hill Pub. Co. New York.

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General Education Course FFT 101 : Communication and Documentation Skills

Credits: (4-0-4-6)

Level: Undergraduate

Semester: Autumn

Pre-requisite: Basic knowledge of English

Objective

To equip the students with skills to write to communicate and articulate in English (verbal as well as writing) and to acquaint the students with the knowledge and use of computers and to introduce the basic principles, organization and operational aspects of computers.

Course Content

UNIT I 15 lectures

Introduction to Communication & Grammar : Consonant & Vowel Sounds, Indianism, Syllable & Syllable Stress, Determiners, Articles, Tense & Time, Preposition, Prepositional Phrases, Subject-Verb Agreement, Active – Passive Voice, Intonation & Modulation, Conjunctions

UNIT II 15 lectures

Formal Writing Skills: Composition Writing: Business Letters (Functions of a Business Letter, Layout of a Business Letter, Salient Features of a Business Letter, Kinds of Business Letter, Application Writing)

UNIT III 10lectures

Conversation Skills: Nature of Conversation, Purpose of Conversation, Guidelines for Effective Conversation Skills, Proverbs used in Everyday Conversation with their Meanings/Explanations

UNIT IV 7 lectures

Documentation Skills: Introduction to Documentation: Meaning, Purpose, Need.

UNIT V 13 lectures

A short introduction to Computers, digitalized era, global connection via net, Drafting of Text, Excel, E Mails, Making Presentations, MS Word

Practical

Communication Skills

- Verbal & Non Verbal Communication
  Verbal Communication - Extempore, Just a Minute, Declamation, Dialogue, Monologue
  Non verbal Communication - Guess the Mime, Dumb Charades, Formal & Informal Writing, Facial Expressions, Dressing & Clothing
- Oral Communication - Day to today talk, formal talk, informal talk, conversation
- Body Language
  Right body postures, Eye Contact, Pet Fiddles, how to walk, talk and present oneself.
- Group Discussion Skills(Meaning, Characteristic, Do's & Don'ts, Relevance, Moderating a group Discussion
- Presentation Skills - Confidence, Effective Delivery of ideas, Convincing the audience, basic courtesies
- Public Speaking - Oration, Debates
- English Movie Sessions

Documentation Skills

- Basics of Computers, usage of short cut keys, taking out print outs, page set ups.
- Making of Power point Presentation
- E- Mail (Subject line, salutation, subscription, how to mark cc, drafting, sending of mails, reverts, forwarding of mails, attaching pictures and documents, attaching ppts
- Differentiation between hardware and software and practical usage of both.
- Diagrammatic representation of pie-charts, tabular presentation of data/info, Etc
- Basic use of MS Excel/Spread Sheets

Reference Books:

- High School English Grammar and Composition - Wren & Martin, Publisher - Churchill Livingstone
- Anthology of English Language and Communication Skills - Sharma S R, Jacob, Mark Publications
- Language and Communication Skills - Shastri, Rameshchandra, ABD Publications
- A Course in Academic Writing - Renu Gupta, Orient Blackswan Publications.

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General Education Course: FFT 151 Applied Mathematics

Credits: (3-3-0-6)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Restrictions: The course is compulsory only for students with biology background

Objective :

To investigative skills and an analytical and critical approach to decision making and problem solving.

Course Content:

UNIT I 20 lectures

Algebra - Theory of quadratic equations, Binomial theorem (positive index only), theory of matrices, sum, difference and multiplication of matrices, transpose, adjoint and inverse of matrices, solutions to linear equations.

UNIT II 20 lectures

Trigonometry and coordinate Geometry - Plane trigonometry, complex numbers and De Moivre's theorem, Plane coordinate geometry, Equations of standard curves and their identification.

UNIT III 15 lectures

Calculus- Functions, limit and continuity, Differentiation, tangents and normal, maxima and minima.

UNIT IV 15 lectures

Standards methods of integration, Definite integrals and its simple applications.

UNIT V 20 lectures

Vectors - Vectors in a plane, sum and difference of vectors, scalar and cross products.
Differential Equations - ODE of first order and first degree and their simple applications.

Reference Books:

- Calculus with Maple Labs, B. Rai and W. Krawcewicz, Narosa Publications.
- Ordinary Differential Equations An Introduction, B. Raiand D. P. Choudhury, Narosa Publications.
- Higher Algebra, Hall and Knight, Arihant Publication

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General Education Course FFT 152 : Introduction to Biosciences

Credits: (3-3-0-6)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Restrictions: The course is compulsory only for students with maths background

Objective:

Fundamentals of Bioscience is based on the structural organisation of the human body and the general functions of the body systems, emphasizing the relationship between structure and function.

Course Content:

UNIT I 10 lectures

Level of organization in life (water to protein).

UNIT II 10 lectures

Cytology - cell composition, structure and function.

UNIT III 25 lectures

Animal systems and plant physiology with introductory food biochemistry.
Plant and animal taxonomy - With reference to edible groups and their identification.
Domestication, improvement and disease control of animal and plants species.

UNIT IV 25 lectures

Economic biology - Cereals, pulses, fruits, Vegetables, Beverages, Meat, Dairy, Piggery, aquaculture, and other edible animal and plant product.
Introduction of Ecology and environment of edible species of plant and animals.

UNIT V 20 lectures

Brief introduction of genetics and evolution of Taxa with human interaction.
Plant and animal breeding, genetic engineering and GM Food (a brief introduction).

Reference Books:

- Biosciences by Taylor, Cambridge University Press.
- Biology by Storer, Viva publishing.

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SEMESTER-II

Skill Course FFT 125 : Food Processing Equipments

Credits: (3-0-2-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: Course in Food processing (FFT 321)

Objective

Plan and carry out a course of action demonstrating the ability to manage time, money, energy/effort, energy/fuel, ingredients and equipment, according to a given situation

Course Content

UNIT I 5 lectures

Principle considerations of agricultural and food Processing Equipments.

UNIT II 15 lectures

Food Processing equipments: Types and Principle of dryers.

Types of heat exchanger, Principle of heat Exchangers and Evaporators, pasteurizer, Blancher, Retorts and boilers.

Low Temperature processing equipment: Refrigeration system and freezer.

UNIT III 5 lectures

Material handling equipments like belt conveyor, screw conveyor, bucket elevator and pneumatic conveyors.

UNIT IV 10 lectures

Mechanical separation: filtration, sieving, centrifugation sedimentation;

UNIT V 10 lectures

Equipments for size reduction, Mixing, and Extrusion etc.

Practical:

- Study of dryers, and its efficiency ;
- To study elevating and conveying equipment's,
- Sieve analysis and determination of its efficiency.
- To study extrusion technology and pasta making.
- Mixing index determination for solid mixing
- Visit to food processing plants.

Reference Books

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

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Skill Course FFT 126 : Technology of Processed and Preserved Foods

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: Course in Food science (FFT 322)

Objective

To develop proficiency skill in producing different processed fruits &vegetables food products, operating& maintenance the modern equipment's& machineries, Make different processed food products with quality assurance, and Process of Packaging, Storing & marketing.

Course Content

UNIT I 5 lectures

An overview of types of processed fruit and vegetable Products: juice, squashes, RTS, sauce, ketchup, jam, jelly, marmalade etc.

UNIT II 5 lectures

Pickles and chutneys: Preparation of various types of pickles- theory and practice; preparation of sauces and chutneys.

UNIT III 5 lectures

Pectin: Raw materials; processes and uses of pectin.

Vinegar: Types, General methods of preparation.

UNIT IV 5 lectures

Cereal products: Wheat, Rice, Legumes and Oil seeds: Composition, general processing and their products etc.

UNIT V 10 lectures

Definition of milk, colostrums, factors affecting composition of milk. Constituents of milk. Transportation, reception, grading and general processing of milk. An overview of types of market milk and milk products.

Meat - post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.

Practical

- Dehydration of fruits & Vegetables
- Preparation of Jelly, Marmalades, Sauce and Squash
- Pectin estimation
- Milling of rice with emphasis on quality and recovery.
- Gluten content estimation
- To conduct the platform tests of milk sampling of dairy products.
- Determination of moisture and protein of milk.
- Study of processed food samples available in market pasteurized milk, ketchup, squash, jelly, biscuit, soybean oil.

Reference Books

- Food Science by N.N. Potter, CBS publishing.
- Food Science by Srilakshmi, New Age International Publishing Ltd.
- Food Science by Manay, New Age International Publishing Ltd.

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Skill Course: FFT 127 : Introduction to Food Quality Management

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: Course in Food hygiene and Food plant sanitation

Objective

To learn about quality management in food production chain and understand the significance of safe processing of foods.

Course Content

UNIT I 5 lectures

Quality Management System- ISO 9000

UNIT II 5 lectures

Management Principles, Process Model, ISO 9000 Family, principles and requirements of ISO 9001

UNIT III 5 lectures

Food Safety Management System- Key role, Principles of FSMS, ISO-22000.

UNIT IV 5 lectures

HACCP- Prerequisites; GMP/GHP, Cleaning and Sanitation, Pest Control, Recall Procedures.

UNIT V 10 lectures

Principles and steps of HACCP Plan, Hazard Identification, Risk assessment Risk communication with communication agencies and Hazard analysis, CCP Decision Tree, HACCP Plan.

Practical:

- To conduct Hazard Analysis & Risk Assessment of identified hazards
- Determination of CCP through CCP Decision Tree
- Formation of CCP Monitoring Checklist
- Identification of PRP's (GHP & GMP) of food plant
- Preparation of detail flow diagram of manufacturing process & identification of potential hazards of food at each step/process
- Preparation of sample pages of Quality Manual
- Preparation of sample pages of Management System Procedure (MSP)
- Preparation of sample pages of Standard Operating Procedure (SOP)
- Preparation of sample pages of Formats for Quality Management System
- Preparation of on-site audit plan
- Preparation of an Audit CheckList /Observation Sheet
- To conduct Document Review (Adequacy Audit) before Audit
- To conduct opening meeting of audit
- To conduct Closing Meeting
- Preparation of Audit Plan Schedule before an Internal Audit
- To conduct an Audit Meeting before conducting Internal/External Audit
- Preparation of Corrective /Preventive Action Recommendation for the organization after Audit (Report Writing)
- Preparation of report by auditee after correction of non-conformities
- To conduct audit Follow-up

Reference Books

- Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.

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Skill Course FFT 128 : Food Quality and Analysis I

Credits: (3-0-4-5)

Level: Undergraduate

Semester: Spring

Pre-requisite: Course in Food processing

Objective:

To learn about physical and chemical contaminants in foods.

Course Content:

UNIT I 5 lectures

Introduction to food quality: Definition, quality concepts, quality attributes (safety, sensory, shelf life, convenience, extrinsic attributes), factors affecting food behaviour.

Sampling techniques of food and water

UNIT II 15 lectures

Methods for food analysis: Estimation of carbohydrates, protein, fat, vitamins and minerals

Contamination in Food- : Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionucleocides, solvent residues, chemicals)

UNIT III 5 lectures

Natural toxins. Contaminants formed during processing – nitrosamines, acrylamide etc. natural food contaminants and contaminants form packaging materials.

UNIT IV 15 lectures

Food Additives: Introduction, need of food additives in food processing and preservation. Characteristics and classification of food additives. Safety and quality evaluation of additives and contaminants, Acute and chronic

studies, NOEL, ADI, LD50. Colour: Introduction, importance, classification- artificial and natural. Use of plant tissue culture, polymeric colors etc for color.

Sweeteners- Introduction, importance, classification- natural and artificial, chemistry, technology and toxicology, consideration for choosing sweetening agents.

Antimicrobial agents. -Nitrites, sulphides, sulphur-di-oxide, sodium chloride, hydrogen peroxide.

Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants.

UNITV 5 lectures

Food Adulteration: Definition, types of adulterants and their detection.

Practical

- Preparation of standard solutions for the chemical analysis i.e. HCl, H_2SO_4, $KMnO_4$, Sodium Thiosulphate and Iodine.
- Determination of proximate composition of food- moisture, protein, crude fat, crude fiber, ash, total carbohydrates and Calorific Value by standard AOAC procedures
- Determination of minerals in food products: Calcium by Titration, Phosphorus by Spectrophotometer, Iron by Spectrophotometer,
- Determination of pH and total acidity of various food samples.
- Determination of total sugars, reducing and non-reducing sugars in various food samples.
- Detection of adulterants in various food(turmeric, red chilli, coffee, honey, flour)etc.

Reference Books:

- Hand Book of Food Analysis by Nollet & Toldra, CRC publishing ltd.
- Hand Book of Analysis & Quality Control for Fruit & Vegetable Products by Rangana, Tata Mcgraw hill publishing.
- Introduction to the chemical analysis of foods by Nielson, CBS publishing.

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General Education Course FFT 102 : Environmental Studies I

Credits: (3-0-4-5)

Level: Undergraduate

Semester: Spring

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with the natural resources and the ecosystem, and ecology.

Course Content

UNIT I 5 lectures

The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance.

Natural Resources: Renewable and Non-Renewable Resources, Natural Resources and Associated Problems, Renewable Resources

UNIT II 15 lectures

Ecosystems: Concept of an Ecosystem, Structure and Functions of an Ecosystem, Energy Flow in the Ecosystem: The Water Cycle, The Carbon Cycle, The Oxygen Cycle, The Nitrogen Cycle, The Phosphorus Cycle, The Sulphur Cycle, The Energy Flow, Integration of Cycles in Nature, Food Chains, Food Webs and Ecological Pyramids, Introduction, Types, Characteristic Features, Structure and Functions.

UNIT III 3 lectures

Biodiversity: Biodiversity at Global, National and Local Levels, India as a Mega-Diversity Nation, Conservation of Biodiversity: In Situ and Ex Situ.

UNIT IV 15 lectures

Pollution: Definition, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards, Solid Waste Management: Causes, Effects and Control Measures of Urban and Industrial Waste, Pollution Case Studies, Social Issues and the Environment From Unsustainable to Sustainable

Development, Urban Problems Related to Energy, Water Conservation, Rainwater Harvesting, Watershed Management, Consumerism and Waster Products

Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents an Holocaust.

UNIT V 7 lectures

The Environmental (Protection) Act- The Air (Prevention and Control of Pollution) Act, The Water (Prevention and Control of Pollution) Act

Value Education: Environmental Values, Valuing Nature, Valuing Cultures, Social Justice, Human Heritage, Equitable Use of Resources, Common Property Resources, Ecological Degradation.

Practical:

- Visit to a local area to document environmental assets, river/forest/grasslands
  - Visit to gangatic plain to document environmental diversification in river and grass land.
  - Documenting the environmental assets and comparing with local gazettes
- visit to a local polluted site
  - Enlisting the types of pollutants/wastes visible in allahabad, sangam area before kumbh.
  - Enlisting and comparing the types of pollutants/wastes visible in allahabad, sangam area after kumbh.
  - Observing the anthropogenic change at gangatic river coast near sangam area during kumbh.
- Study of common plants, insects, birds
  - Documenting the special resource features of individual ecosystems. (river/ forest)
- Study of simple ecosystems
  - observing the water cycle- observing how rain recharges ground water like wells and rivers.
  - Observing the energy cycle – by looking different types of insects and birds in the trees.
  - Observing food chains and interpret the food web.
  - Observing water from a pond under the microscope for measuring flora, fauna and turbidity. There are a large number of algae and zooplankton that form the basic food chains of the aquatic ecosystem

Reference Books

- Kumarasamy, K., A.Alagappa Moses And M. Vasanthy, 2004. Environmental Studies, Bharathidsan University Pub, 1, Trichy
- Rajamannar, 2004, Environemntal Studies, Evr College Pub, Trichy
- Kalavathy,S. (Ed.) 2004, Environmental Studies, Bishop Heber College Pub., Trichy

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General Education Course: FFT 103 Financial Accounting

Credits: (3-0-0-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with the accounting and balance sheet preparation to develop the skill to perform at different enterprises related to the accounting and transactions.

Course Content

UNIT I 8 lectures

An Overview of Accounting: Definition of accounting, Types of accounting, Accounting and business.

Basic Components of Financial Statements: Account classes, Account groups, Accounts, Subsidiary accounts, Basic accounting equation.

UNIT II 8 lectures

Journalizing sale, purchase, collection, and payment transactions: Double entry book keeping (the terms debit and credit), General journal and journal entries, General ledger and posting.

UNIT III 8 lectures

Journalizing Transactions Related to Expenses: Cost accounting accounts, Cost accounting records, Transferring cost accounting records to financial accounting by using transfer accounts.

UNIT IV 11 lectures

Accounting of Value Added Tax: VAT deductible, VAT payable, VAT carried forward

Accounting for Current Assets: Cash and cash equivalents (denominated in domestic and foreign currency), Trade receivables,

UNIT V 10 lectures

Preparing the Financial Statements: Balance sheet, Income statement.

Reference Books

- Chandra P. 2000. Financial Management. Tata McGraw Hill.
- Khan MY & Jain PK. 2004. Financial Management: Text, Problems and Cases. Tata McGraw Hill.
- Ramachandran N & Kakani RK. 2005. Financial Accounting for Management. Tata McGraw Hill.
- Van Horne JC. 1997. Financial Management and Policy. Prentice Hall.

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General Education Course FFT 104 : Introduction to Computer Application

Credits: (3-0-2-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with the knowledge and use of computers and to introduce the basic principles, organization and operational aspects of computers.

Course Content

UNIT I 10 lectures

Microsoft Word and its applications (in relation with Food Industry)

Font formatting, Paragraph formatting, Inserting images, auto shapes symbols, diagrams, header & footer, References, watermarks and Hyperlinks, Style & Formatting, Mail Merge through word, Excel, Access database, Page setup, Printing a document

UNIT II 10 lectures

MS Excel and its applications (in relation with Food Industry)

Making column chart & pie chart and chart formatting, Use of general functions & formula (autosum, using basic arithmetic operators: +,-,*,/), Use of filter & sorting, Cell references, header & footer, age setup, use of page break preview, printing worksheets.

UNIT III 15 lectures

MS PowerPoint and its applications (in relation with Food Industry)

Creating own design, formatting objects on a slide, Use of Slide Master to control the design & formatting of a presentation, Use of Image, audio, video in the presentation, Slide show setup, slide transition, use of animation, Use of narration in presentation, Print setup & Printing handouts of a presentation.

UNIT IV 5 lectures

Internet & Web Applications (in relation with Food Industry)

UNIT V 5 lectures

Websites, Internet applications, Google Applications (G mail, Google search, G Drive, Google Docs) and other Email Services, Industry customer approach.

Practical

- Applications of MS Excel to solve the problems of food technology
- Statistical quality control, Sensory evaluation of food, and Chemical kinetics in food processing;
- Use of word processing software for creating reports and presentation;
- Familiarization with the application of computer in food industries -Milk plant, Bakery Units, Fruit & Vegetable processing Unit;
- Familiarization with software related to food industry;
- Ergonomics application in the same; Visit to Industry and case study problems on computer.
- Visit to Industry and case study problems on computer.

Reference Books

- Fundamentals of Computers by E. Balagurusamy (Author) Publisher: McGraw Hill Education (India) Private Limited
- Ms Office 2007 in a Nutshell by S. Saxena (Author) Publisher: S.Chand (G/L) & Company Ltd
- Computer Fundamentals Paperback – by P. K. Sinha (Author) Publisher: BPP

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Skill Course FFT 130 : Industrial Training-I for 15 days

Credits: (0-0-4-2)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course in Food processing

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SEMESTER-III

Skill Course FFT 221 : Unit Operations in Food Processing

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on food processing equipments

Objective

To acquaint with basic principle of Food Engineering and its Processes, with importance of various foods process and their evaluation.

Course Content

UNIT I 5 lectures

Introduction: Basic principles of food processing, Conservation of mass and energy, Units and dimensions of engineering parameters, dimensionless ratios, and calculations involving various physical parameters.

UNIT II 10 lectures

Distillation: Distillation, Steam distillation, applications and equipment – determination of height equivalent of theoretical plate (HETP) – McCabe-Thiele method – reflux ratio. Molecular distillation, theory and examples. Mass transfer phenomenon applied to food systems

UNIT III 10 lectures

Evaporation: Needs, basic principles, Calculations, Single and multiple effect evaporation, Heat economy – enthalpy balances for evaporators, Vapour recompression, Thermo and mechanical systems, boiling point elevation, Falling film, climbing film tubular evaporators, plate evaporators, thin film and scraped surface evaporators.

UNIT IV 10 lectures

Contact Equilibrium Separation Processes: Concentrations, Gas-liquid equilibria, Solid liquid equilibria, Equilibrium concentration relationships, operating conditions; Basics of Solid-liquid extraction processes, liquid-liquid extraction, with food application examples, Crystallization

UNIT V 10 lectures

Leaching and Extraction: Leaching – Leaching equipments – principles of continuous and countercurrent leaching. Liquid extraction – extraction equipment – principles of extraction. Special extraction techniques – supercritical fluid extraction. Applications; extraction of Fatty acids, oleoresins and essential oils; Relative advantages, limitations and economics. Mechanical extraction – Expellers, screw press, filter press.

Reference Books

- Albert Ibarz, Cannovas, G.V. Unit Operations in Food Engineering. CRC Press. 2003.
- J.M. Coulson, J.F. Richardson, J.H. Harker - Coulson & Richardson's Chemical Engineering - Vol 2 Particle Technology and Separation Processes, Fifth Edition, 2002. Butterworth & Heinemann - Elsevier science Ltd.

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Skill Course FFT 222 : Basic Food Chemistry

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint with properties and role of various constituents in foods, interaction and changes during processing.

Course Content

UNIT I 2 lectures

Food Constituents: Proximate composition of foods, water in foods,

UNIT II 6 lectures

Carbohydrate: Introduction, Definition nomenclature, classification. General properties of sugar (physical and

chemical) identification of common mono saccharides, disaccharides and polysaccharides, determination of the amount of reducing and non – reducing sugars. Chemistry of starch, glycogen, cellulose, gums and mucilage, crude fibre.

UNIT III 7 lectures

Protein: Physical and Chemical properties of amino acids. Classification of proteins, amino acid sequence in proteins, pleated sheet and helix structure of protein tertiary structure and conformation of proteins. Physical and chemical properties of proteins, molecular weight of proteins, protein denaturation.

UNIT IV 7 lectures

Lipids: Classification of lipids, fatty acid, soap and detergent, essential fatty acids, fats and oils saponification number, acid numbers, iodine value, acetyl value, Reichart – Meissl number, Oxidative and hydrolytic rancidity, reversion.

UNIT V 8 lectures

Vitamins & minerals: Occurrence, chemistry, food sources, deficiency, loss during storage and processing of foods

Natural Pigments and Flavouring Agents: Chlorophyll, carotonoids, anthocyannics, anthoxanthins, flavonoids, tannins. Natural flavour constituents.

Practicals

- Qualitative test for proteins and fats/oils and their identification in unknown mixtures - Free fatty acid, Peroxide value, Saponification value, RM Number, TBA test, Iodine value.
- Quantitative estimation of proteins by Lowry and Bradford methods
- Estimation of vitamins - ascorbic acid..
- Analysis of edible common salt for MC, iodine and total chlorides.
- Estimation of ammonia in water.
- Estimation of plant pigments - carotenoids, flavonoids
- To determine alcohol soluble and insoluble solids in peas.
- Effect of heat on proteins
- Determination of smoking points of fat and oils

Reference Books

- Belitz HD.1999. Food Chemistry. Springer Verlag.
- DeMan JM. 1976. Principles of Food Chemistry. AVI.
- Fennema OR.1996. Food Chemistry. Marcel Dekker.
- Meyer LH. 1987. Food Chemistry. CBS

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Skill Course FFT 223 : Food Quality and Analysis-II

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A basic course in Food quality and analysis (FFT 327)

Objective

To develop an understanding and methodologies of instrumental techniques in food analysis used for objective methods of food quality parameters.

Course Content

UNIT I 2 lectures

Concept of quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation

UNIT II 6 lectures

Colour:Importanceandneedofcolourdetermination,methodsofcolourdeterminationwith Hunter Colour lab, CIE system and their applications.

Flavour: Importance of flavour, food flavours, factors affecting food product flavours, measurement of food flavours.

Texture: Food texture, Physical characteristics of food, working of texture measuring instruments such as Texture Analyser, Texture Profile Analysis (TPA).

UNIT III 7 lectures

Chromatography: Principle and working of Gas chromatography(GC), High pressure liquid chromatography (HPLC), Thin layer chromatography (TLC), Column Chromatography, chromatographic methods applied as quality control.

UNIT IV 8 lectures

Spectroscopy: Beers and Lambert's Law. General principles of colorimeters and spectrophotometers, Atomic absorption spectroscopy, IR spectroscopy, Flouremetry.

Special Techniques: Electrophoresis, Immuno assay techniques.

UNIT V 7 lectures

Introduction to quality attributes: Appearance, flavour, textural factors and additional quality factors.

Sensory Analysis: Introduction to sensory analysis; general testing conditions, Requirements of sensory laboratory; organizing sensory evaluation programme. Factors influencing sensory measurements; Sensory quality parameters -Size and shape, texture, aroma, taste, color and gloss; Detection, threshold and dilution tests, discrimination, descriptive, affective; Ranking tests; Methods of sensory evaluation of different food products.

Practical

- Demonstration of HPLC and GC for analysis of bioactive compounds, antioxidant, pesticides, fatty acids etc.
- Qualitative analysis of compounds by chromatography techniques- a) Thin layer Chromatography, b) Paper Chromatography: Descending, Ascending and Circular Paper chromatography.
- Estimation of metals - Fe, Ca, Cu, Cu, Pb, Zn, Sn and Cr- by atomic absorption spectrometer and flame photometer. Demonstration of AAS for estimation of metals.
- Colour measurement (L a b values) by X Rite.
- Use of electrophoresis in the determination of proteins.
- Determination of pesticide residue in water and cauliflower by HPLC.
- To conduct sensory evaluation of the given samples using descriptive method.
- To perform the difference testes (Paired comparison test, Duo trio test and Triangle test) in the given sample
- To study and conduct sensory evaluation of different pairs of sugar with lemon samples using 'paired test' and prepare score card for the same.
- Texture analysis of raw and processed foods.

Reference Books

- Clifton M & Pomeranz Y. 1988. Food Analysis - Laboratory Experiments. AVI Publ.
- Gruenwedel DW & Whitaker JR. 1984. Food Analysis Principles and Techniques. Vol. I. Physical Characterization. Marcel Dekker.
- Nollet LML. 1986. Handbook of Food Analysis. Vol. I. Marcel Dekker.

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Skill Course: FFT 224 : Cereal Pulses and Oil Seed Technology

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course in Food Science (FFT 322)

Objective

To acquaint with production and consumption trends, structure, composition, quality evaluation, and processing technologies for product development and value addition of various cereals, pulses and oilseeds.

Course Content

UNIT I 6 lectures

Status, production and major growing areas of cereals, in India and world.

Coarse Cereals Products: Maize- Dry and wet milling of corn, corn products, sorghum, pearl millet and small millets processing.

UNIT II 9 lectures

Wheat Processing: Wheat classification, Functionality of wheat flour components.

Rice Processing: Classification, paddy Processing, Parboiling and treatment for quality improvement, Milling, rice products.

UNIT III 7 lectures

Pulses: Pre-treatment of pulses for milling, milling of major pulses. Methods to improve recovery, Nutrition and anti- nutritional factors in pulses.

UNIT IV 5 lectures

Oil seeds Processing: Groundnut, Mustard, Soybean, Sunflower, Safflower, Sesame and other oil seeds processing.

UNIT V 3 lectures

Special Topics: Processing & Utilization of Soya bean for value added products, Innovative products from cereals, pulses and oilseeds. Extrusion technology for cereals

Practical:

- Physico-chemical examination of wheat and its products test weight, kernal hardness, gluten content.
- Millingof rice with emphasis on quality and recovery.
- Physicochemical tests of rice and flour quality of wheat- geletinization temperature, water absorption tests.
- Determination of Yeast activity used in fermented cereal products.
- Quality test for wheat flour used in the baked products. Maltose Number, Water Absorption, Sedimentation value, Alcohol Acidity
- Quality tests for oils.
- Texture profile analysis of baked cereal food products by texture analyzer.
- Products of Soybean- tofu, soya milk,
- Estimation of antinutritional factors in pulses- Trypsin inhibitors and tannins.
- Visit to dhal mills

Reference Books

- Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
- Dendy DAV & Dobraszczyk BJ. 2001. Cereal and Cereal Products. Aspen.
- Hamilton RJ & Bhati A. 1980. Fats and Oils - Chemistry and Technology. App. Sci. Publ.
- Hoseney RS. 1994. Principles of Cereal Science and Technology. 2nd Ed. AACC.

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Skill Course FFT 225 : Human Nutrition

Credits: (3-1-0-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students about importance of nutrition, balanced diets, therapeutic diets for health and role of food and nutraceuticals in health.

Course Content

UNIT I 8 lectures

Introduction to human nutrition.

Macronutrients and micronutrients- Classification and functions.

Digestion, absorption and assimilation of nutrients.

UNIT II 15 lectures

Energy metabolism- Components of energy expenditure, Basal Metabolic Requirements and Activity, Recommended Dietary Allowances, Food Groups, Concept of a balanced diet, Methods of evaluation of nutritive value of foods.

Nutritional assessment and nutritional policies- Salient features, concept of community nutrition

UNIT III 15 lectures

Carbohydrates- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

Proteins- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

UNIT IV 10 lectures

Fat- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

UNIT V 12 lectures

Vitamin- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

Minerals- Types, functions, sources, requirement, storage, Effect of deficiency and excess.

Water and electrolytes- Concept and importance

Reference books

- Nutrition Science by B. Srilakshmi
- Fundamentals of Foods & Nutrition by Sumati R. Mudambi
- Textbook of Nutrition : A Life cycle approach by Ravinder Chadha

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General Education Course FFT 201 : Crop Production: Concepts and Practices

Credits: (2-0-0-2)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with the basics of agriculture and crop farming so as to learn the related field of food processing such as farm machinery, land & water resources, and horticulture.

Course Content

UNIT I 5 lectures

Agriculture and its role in national development, food security; General features of climate - India; Crop environment, weather and significance of various weather elements;

Crop production - definition and scope, crop classification based on season, life cycle, taxonomy and economic use; Growth and yield of crops, growth parameters, yield attributes and factors affecting them

UNIT II 5 lectures

Quality of good seed, ideal condition for germination, seed treatment, hybrid and composite seeds, categories of seeds (certified, foundation and breeder seed); Importance of sowing time, seed rate, sowing methods, plant population; Tillage and Inter-culture operations.

UNIT III 5 lectures

Irrigation - scheduling, methods and water use efficiency; Harvesting, threshing, winnowing, storage and processing.

UNIT IV 10 lectures

Crop rotations, mixed cropping, inter cropping, its objectives and importance; Definitions of mono-cropping, double cropping, multiple/intensive cropping, relay cropping.

Soil as a three phase disperse system, its physical chemical and biological properties; Soil fertility and soil productivity, manures and fertilizers,

UNIT V 5 lectures

Classification of vegetable crops; Types of vegetable farming; Principles of vegetable production; Raising of vegetable seedlings under different environmental conditions

Concepts in Horticulture - methods of propagation, systems of planting and layout, fruit growth and development, fruit maturity and ripening, Post harvest management of fruits.

Reference Books

- Batnakar S & Schware R. 2000. Information and Communication Technology in Development- Cases from India. Sage Publ.
- Meera SN. 2008. ICTs in Agricultural Extension: Tactical to Practical. Ganga- Kaveri Publ. House. JangamWadiMath, Varanasi.
- Willem Zip. 1994. Improving the Transfer and Use of Agricultural Information – A Guide to Information Technology. The World Bank, Washington.

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General Education Course FFT 202 : Food Business Management

Credits: (3-0-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To give basic fundamentals to students for managing the food processing operations starting for raw material procurement to the end consumer and familiarizing them with international trade.

Course Content

UNIT I 5 lectures

Business Management: introduction, theories and functions, food industry management, marketing management and human resource development, personal management. Sectors in food industry and scale of operations in India.

UNIT II 5 lectures

Human Resource Management: Study the basics about HR and related policies and capacity mapping approaches for better management.

UNIT III 10 lectures

Consumer behavior towards food consumption, Consumer Surveys by various Institutes and Agencies, various journals on consumer behavior and market research, internet based data search.

UNIT IV 15 lectures

International trade: basics, classical theory, theory of absolute advantage, theory of comparative modern theory, free trade- protection, methods of protection, quotas, bounties, exchange control, devaluation, commercial treaties, terms of trade, balance of payments, Exim policy, foreign exchange, mechanics of foreign exchange, GATT, WTO, role of WTO. International trade in agriculture. World trade agreements related with food business, export trends and prospects of food products in India.

UNIT V 10 lectures

World consumption of Food: patterns and types of food consumption across the globe. Ethnic food habits of different regions. Govet. Institutions related to international ad trade; APEDA, Tea board, spice board, wine board, MoFPI etc. management of export import organization, regristration, documentation, export import logistics, case studies. Export and import policies relevant to horticultural sector.

Reference Books

- Chhabra TN & Suria RK. 2001. Management Process and Perspectives. Kitab Mahal.
- Jhingan ML. 2005. International Economics. 5th Ed. Virnda Publ.
- Kotler P. 2000. Marketing Management. Prentice Hall.
- Reddy SS, Ram PR, Sastry TVN & Bhavani ID. 2004. Agricultural Economics. Oxford & IBH.

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General Education Course FFT 203 : Communication Skills and Technical Writing

Credits: (3-2-0-5)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A basic course on Communication and Documentation skills (FFT 301)

Objective

To equip the students/scholars with skills to write dissertations, research papers, etc. and equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing).

Course Content

UNIT I 15 lectures

Grammar: Expressions, Modals & Moods, Word Stress, Fluency, Voice, Enhancing Vocabulary Punctuations

UNIT II 20 lectures

Technical Writing:

Introduction to Technical writing – Definition, types, characteristics, Report Writing, CV & Resume making, Research paper

UNIT III 10 lectures

Effective Communication Skills: Power Point Presentations (Subject-Oriented), Soft Skills - Proper Body Postures, Right/Positive Body Language, Eye Contact, Public speaking, Interactive Communication Skills -Group Discussions, Debates, Conversations, Telephonic Etiquettes, Facing an interview

UNIT IV Tutorial 15 lectures

Communication Skills: How to make Delivery of Content Effective, Proper Articulation, Modulation, Voice Throw, Proper Stress on Words, Presenting PPT's, Confidence Building, Motivation, Writing Covering Letters , Filling Application Forms

UNIT V Tutorial 15 lectures

Technical Writing : Documentation of Academic credentials, Writing of Introduction, Acknowledgement, Abstract & Conclusion, Commonly used Abbreviations in the Thesis & Research Communication, Structuring the Presentation, Learning how to make PPT's, number of Slides, font, font size, Table Insertions, Picture, Clip Art, Chart, Grammatical Accuracy

Reference Books

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

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General Education Course FFT 204 : Basic Concepts in Laboratory Techniques Practical

Credits: (0-0-2-1)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with handling and analyzing the high end euipments and to learn the concept and principles of food analysis euipments.

Course Content

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; washing, drying and sterilization of glassware

Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution, Handling techniques of solutions; Preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values.

Preparation of different agro-chemical doses in field and pot applications

Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability

Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

General Laboratory Safety: Preparing for laboratory work, during laboratory work and cleaning up before leaving, General Characteristics & procedure for handling & storage of hazardous materials and control of hazards.

Reference Books

- Furr A.K. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
- Gabb M.H. & Latchem WE. 1968. A Handbook of Laboratory Solutions. Chemical Publ. Co.

SEM IV

Skill Course FFT 226 : Fruits and Vegetable Technology

Credits: (2-0-4-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course on processed and preserved foods (FFT 325)

Objective

To acquaint with the proper handling technologies of fruits and vegetables to reduce post harvest losses and acquaint with principles and methods of preservation of fruits and vegetables into various products.

Course Content

UNIT I 2 lectures

Pre-packaging of fresh fruits and vegetables. Storage techniques for fresh fruits and vegetables.

UNIT II 6 lectures

Primary processing: grading, sorting, cleaning, washing, peeling, slicing and blanching

UNIT III 6 lectures

Dehydration of fruits and vegetables using various drying technologies like sun drying, solar drying, osmotic, tunnel drying, fluidized fed drying, freeze drying.

UNIT IV 8 lectures

Processing of juices: Processing of vegetable juice, Processing of fruit juice

Manufacturing of fruit juices concentrates, puree and pastes, Preparation of jam, jellies and marmalades.

UNIT V 8 lectures

Preparation of preserve and candied fruits, Pickling of fruits and vegetables.,Waste management in fruits and vegetable processing units

Practical

- Determination of ascorbic acid, acidity, total soluble soild.
- Evaluation of pectin content.
- Preparation and quality evaluation of fruit jam, fruit jelly, fruit marmalade; squash
- Processing of tomato products; Ketchup
- Preparation of dehydrated vegetables.
- Determination of chemical preservatives- benzoic acid, KMS
- Visit to commercial storage, and canning unit.

Reference Books

- Lal G, Siddapa GS & Tandon GL.1986. Preservation of Fruits and Vegetables. ICAR.
- Salunkhe DK, Bolia HR & Reddy NR. 1991. Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables. CRC.
- Thompson AK. 1995. Post Harvest Technology of Fruits and Vegetables. Blackwell Sci.
- Verma LR. & Joshi VK. 2000. Post Harvest Technology of Fruits and Vegetables. Indus Publ.

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Skill Course FFT 227 : Introduction to Food Packaging

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A basic course on food processing

Objective

To acquaint the students with packaging methods, packaging materials, packaging machineries, modern packaging techniques etc.

Course Content

UNIT I 7 lectures

Packaging–Concepts, definition, Significance, classification. Deteriorative changes in food and packaging methods for prevention.

UNIT II 7 lectures

Primary packaging media – Properties and application of Paper, paper boards, metals, plastics, glass. Food containers-rigid containers and flexible packaging materials. Application of different packaging materials in food industry. eg. bags, pouches, wrappers, cartons etc.

UNIT III 8 lectures

Factors determining the packaging requirements of various foods, Packaging of perishable and processed foods.

UNIT IV 4 lectures

Advancements in packaging: Biodegradable packaging, Edible packaging,

UNIT V 4 lectures

Active packaging, Modified atmosphere packaging, Vacuum packaging, Aseptic packaging

Practical

- Familiarization of different types of packaging materials.
- To perform vacuum packaging of food sample and carry out its storage study.
- To perform modified atmospheric packaging of food sample and carry out its storage study.
- Cut out analysis of canned food
- Determination of wax absorptiveness of paper

Reference Books

- Robertson, G.L. "Food Packaging: Principles and Practice". 2nd Edition. Taylor & Francis, 2006.
- Ahvenainen, Raija. "Novel Food Packaging Techniques". Wood Head Publishing, 2003.
- Mathlouthi, M. "Food packaging and Preservation". Aspen Publications, 1999.
- Paine, F.A. and Paine, H.Y. 1983. A Handbook of Food Packaging. Leonard Hill, Glasgow, UK.

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Skill Course FFT 228 : Dairy Technology

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course in food science (FFT 322)

Objective

To acquaint with techniques and technologies of testing and processing of milk into various products and by products.

Course Content

UNIT I 4 lectures

Physical properties of milk: Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing,boiling point, specific heat, OR, electrical conductivity.

UNIT II 9 lectures

Lactose: Lactose (alpha and beta forms). Significances of lactose in dairy industry.

Milk fat: Composition and structure, and physical properties, crystallization, structure of fat granules, lipolysis, autoxidation, fat constants (saponification value, iodine value, RM value, Polenske value, peroxide value).

Protein and Enzymes: General structure, amphoteric nature, difference between casein and serum protein, differenttypes of casein (acid and rennet), uses of casein, fractionation of protein. Enzymes- catalase, alkaline phosphatase, lipases and proteases.

UNIT III 7 lectures

Market milk industry and milk products: Systems of collection of milk, Reception, Platform testing, Various stages of processing: Filtration, Clarification, Standardization,Homogenization, Pasteurization, Sterilization, Packaging and Storage, Cleaning and Sanitation

UNIT IV 5 lectures

Description and working of clarifier, cream separator, homogenizer and plate heat exchanger.

UNIT V 5 lectures

Flow diagram for manufacture of following milk products: Flavoured milk, Butter, ice-cream, milk powder.

Practical

- To perform platform tests in milk. (Acidity and COB).
- To estimate moisture content in milk.
- To estimate skim milk protein by titration method.
- To estimate milk fat by Gerber method, SNF and specific gravity of milk.
- To check the efficiency of sterilization of milk by Turbidity test.
- To prepare casein and calculate its yield.
- Preparation of flavoured milk
- Preparation of butter
- Visit to a milk industry

Reference Books

- Aneja RP, Mathur BN, Chandhan RC & Banerjee AK. 2002. *Technology of Indian Milk Products*. Dairy India Publ., Delhi.
- De S. 1980. *Outlines of Dairy Technology*. Oxford Univ. Press Publ., New Delhi.
- Smit G. 2003. *Dairy Processing – Improving Quality*. CRC-Woodhead Publ.
- Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. 1999. *Dairy Technology – Principles of Milk Properties and Processes*. Marcel Dekker.

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Elective Course: FFT 251: Technology of Meat, Fish and Poultry

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course on Food Science (FFT 322)

Objective

To provide an understanding of the technology for handling, processing, preservation and bi-product utilization of meat, poultry and fish products processing.

Course Content

UNIT I 5 lectures

Development of meat and poultry industries in India. Ante-mortem examination of animals and poultry birds. Slaughter and dressing, post-mortem examination. Post-mortem changes in meat and factors affecting them.

UNIT II 4 lectures

Nutritive value of meat. Whole sale and retail cuts. Meat tenderization methods.

UNIT III 8 lectures

Canning of meat and meat products, Restructured meat products, sausages, curing and smoking of meat. Disposal and utilization of meat industry by- products

Chilling and freezing of carcass and meat; canning, cooking, drying, pickling, curing and smoking; prepared meat products like salami, kebabs, sausages, sliced, minced, corned; intermediate moisture and dried meat products; meat plant hygiene – GMP and HACCP; Packaging of meat products.

UNIT IV 7 lectures

Structure, composition and nutritive value of poultry eggs. Poultry dressing, Functional properties of eggs, internal quality of eggs and its preservation.

Eggs spoilage, Spray dried and frozen egg products.

UNIT V 6 lectures

Fish structure and composition. Cold storage, freezing preservation and canning of fish. Picking of fish, fish protein concentrates, fish meal and by products of fish processing industry

Practical:

- Slaughtering and dressing of meat animals
- Study of post-mortem changes; meat cutting and handling
- Evaluation of meat quality
- Evaluation of quality of eggs
- Preparation of meat products
- Visit to meat processing plants.

Reference Books

- Forrest JC. 1975. Principles of Meat Science. Freeman.
- Govindan TK. 1985. Fish Processing Technology. Oxford & IBH.
- Hui YH. 2001. Meat Science and Applications. Marcel Dekker. 32
- Kerry J. et al. 2002. Meat Processing. Woodhead Publ. CRC Press.
- Pearson AM & Gillett TA. 1996. Processed Meat. 3rd Ed. Chapman & Hall.

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Elective Course FFT 252 : Flavour Technology

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A basic course of Food Chemistry (FFT 329)

Objective

To equip the students with the knowledge of flavor science, extraction of pigment and safe storage and nutritional retention principles.

Course Content

UNIT I 65 lectures

Sources of flavours (natural, processed and added), Flavour composites (natural, semi-synthetic and synthetic).

UNIT II 12 lectures

Biogenesis of flavours in food – natural and processed foods (Maillard Reaction and Lipid Oxidation).

UNIT III 3 lectures

Analysis of flavours (Subjective and objective); Formulations of flavours, adulteration, Flavour emulsions, Flavours production in fermented foods, Off-flavours in foods.

UNIT IV 3 lectures

Spices and spice-based products as flavours, Plantation crops as flavours tea, coffee, cocoa and vanilla.

UNIT IV 6 lectures

Sensory evaluation of flavours, selection of flavourist, flavours and legal issues.

Ppractical

- Odour recognition and thresholds tests
- Analysis of different types of flavours such as whole and powdered spices, essential oils, oleoresins, synthetic flavours, plated and dispersed spices-general tests.
- Sensory analysis of flavours; monitoring flavours during food processing
- Preparation of flavour emulsions and their stability
- Study of off-flavours in different foods.

Reference Books

- Ashurst PR. 1994. Food Flavorings. 2nd Ed. Blackie.
- Burdock GA. 2004. Fenaroli's Handbook of Flavor Ingredients.5th Ed. CRC Press.
- Deibler D & Delwiche J. 2004. Handbook of Flavor, Characterization: Sensory Analysis, Chemistry and Physiology. Marcel Dekker.

Elective Course FFT 253 : Fermentation Technology

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: An introductory course of Food Microbiology (FFT 323)

Objective

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

Course Content

UNIT I 6 lectures

History of fermentation. Introduction to fermentation processes, Media formulation and process optimization.

UNIT II 8 lectures

Microorganisms used in food fermentation, Types of cultures, starter cultures: maintenance, propagation and activation of cultures.

UNIT III 5 lectures

Types of fermentation sub-merged/solid state, Batch /continuous fermentation, Fermenter design and operation.

UNIT IV 5 lectures

Fermented Foods-types, methods of manufacture for vinegar, saurkraut, tempeh, miso, soya sauce, bakery foods and traditional Indian foods.

UNIT V 6 lectures

Food related fermentations: Microbial biomass, Single cell protein, baker's yeast and enzyme production

Practical

- Media formulation and sterilization
- Study of fermentation of pulses and millets
- Maintenance and activation of lyophilised starter cultures.
- Study of dough raising power of yeasts
- Production of fermented products viz. saurkraut, idli, curd etc.

Reference Books

- Stanburry P.P. and Whitaker, A. 1984. Principles of Fermentation Technology. Pergamon
- Press, Oxford UK.
- Steinkraus, K.H. 1983. Handbook of Indigenous Fermented Foods. Marcel Dekker, New York.
- Biely, J.E. and Ollis D.F. Bio Chemical Engineering Fundamentals (1986) McGraw Hills.
- Moo-young M. Comprehensive Biotechnology Vol. 1-4 Pergamon Press Oxford.

Elective Course FFT 229 : Bakery and Confectionery Products

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course on processing of cereals (FFT 331)

Objective

To familiarize the students with different form of bakery confectionary and the analysis equipment involved, and to acquire the knowledge of manufacturing process of bakery and confectionary products in range.

Course Content

UNIT I (3 lectures)

Bakery and Confectionery industry; raw materials and quality parameters; dough development; dough chemistry;

UNIT II (3 lectures)

Rheological testing of dough-principles of Farinograph, Mixograph, Extensograph, Amylograph / Rapid Visco Analyzer, Falling number, Hosney's dough stickiness tester.

UNIT III (10 lectures)

Technology for the manufacture of bakery products- detailed description of unit operations for the manufacturing of bread, biscuits, cakes and the effect of variations in formulation.

UNIT IV (8 lectures)

Manufacturing of confectionary products: Characteristics and processing of raw material; Technology of manufacturing of toffee, chocolate, hard boiled candies, bars, chewing gums, bubble gums and Characteristics of finished products.

UNIT V (6 lectures)

Equipment used in bakery and confectionary industry: Construction and working of various equipments like Mixers, proofing chambers, dough dividers, moulder and sheeter, baking ovens, cooling chamber, sealing and packaging machines, Rolling and cutting machines.

Practical

- Quality test for wheat flour used in the baked products. Maltose Number, Water Absorption, Sedimentation value, Alcohol Acidity
- Preparation and quality evaluation of cakes
- Preparation and quality evaluation of biscuits
- Preparation and quality evaluation of nan khatai
- Preparation and quality evaluation of cookies
- Effect of syrup consistency and temperature on the quality characteristics of hardboiled sweets
- Preparation and quality evaluation of chocolate
- Visit to bakery and confectionery industries.

Reference Books

- Dubey SC. 2002. Basic Baking. The Society of Indian Bakers, New Delhi.
- Francis FJ. 2000. Wiley Encyclopedia of Food Science & Technology. John Wiley & Sons.
- Manley D. 2000. Technology of Biscuits, Crackers & Cookies. 2nd Ed. CRC Press.

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General Education Course FFT 205 : Environmental Studies – II

Credits: (3-1-0-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: An introductory course on environmental studies (FFT 305)

Objective

To acquaint the students with environmental aspect like natural resources and biodiversity, and different techniques involved in preserving the environment

Course Content

UNIT I (10 Lectures)

Natural Resources: forest resources, water resources, mineral resources, food resources, energy resources, land resources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life style.

UNIT II (15 Lectures)

Biodiversity and its conservation: Introduction, definition, genetic, species and ecosystem diversity. Bio geographical classification of India, Value of diversity, consumptive use, productive use, social, ethical aesthete and option values.

UNIT III (15 Lectures)

Biodiversity at global, national and local levels. India as mega-diversity nation. Hot-spot of biodiversity. Threat to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts. Endangered and endemic species of India. Updated list of red data book ,Conservation of biodiversity, In-situ conservation of biodiversity.

UNIT IV (10 Lectures)

Environmental Pollution: definition, Causes effect and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards.

UNIT V (10 Lectures)

Solid waste management: causes effect and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management : flood, earthquake, cyclone and landslides.

Reference Books

- Kumarasamy, K., A.Alagappa Moses And M.Vasanthy, 2004. Environmental Studies, Bharathidsan University Pub, 1, Trichy
- Rajamannar, 2004, Environemntal Studies, Evr College Pub, Trichy
- Kalavathy,S. (Ed.) 2004, Environmental Studies, Bishop Heber College Pub., Trichy

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General Education Course FFT 206 : General Biochemistry

Credits: (3-0-2-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: A basic course in Food Chemistry (FFT 329)

Objective

To acquaint the students with scope and importance of biochemistry and the pathways of metabolism of nutrients in human body.

Course Content

UNIT I 3 lectures

Scope and importance of biochemistry in Food Technology.

Aqueous solutions - properties of water - hydrogen ion concentration - acids, bases and their concept - buffers and electrolytes and their functions - acidity, alkalinity and pH determination.

UNIT II 10 lectures

Classification, structure and function of carbohydrates, lipids, proteins, and nucleic acids.

Structure and biological functions of vitamins, Vitamins as co-enzymes.

Classification and biological functions of minerals, Minerals as co-factors.

UNIT III 13 lectures

Enzymes: Classification and nomenclature of enzymes, Physico- chemical nature of enzymes, Enzyme kinetics, Mechanism of enzyme action, Factors affecting enzyme activity.

UNIT IV 14 lectures

Pathways of metabolism of carbohydrates, proteins, lipids.

UNIT V 5 lectures

Hormones as regulators of biochemical pathways- Introductory concept.

A brief account on the biochemistry of the secondary plant products: Alkaloids, flavonoids, anthocyanins, terpenes

Practical

- Qualitative and quantitative estimation of carbohydrates and proteins.
- Measurement of blood Pressure.
- Estimation of haemoglobin in blood.
- Estimation of glucose in blood.
- Qualitative urine analysis for normal and abnormal constituents.

Reference books

- Biochemistry by A. Satyanarayan
- Biochemistry by Keshav Trehan
- A textbook of Biochemistry by A. K. Berry
- L. Stryer, Biochemistry, 1999, IV Edition. Freeman Company, New York.

- Lehninger, Biochemistry, 1982. Worth Publications Inc., CBS Publication, New Delhi.
- H.S. Srivastava, Elements of Biochemistry, Rostogi Publications.
- Outline of Biochemistry, Corn & Stump.

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General Education Course FFT 207 : Statistics and Data Analysis

Credits: (2-2-0-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

The students will be exposed to various research methods and statistical tools required to analyze the experimental data in food research and industry. The focus will be on providing knowledge related to research process, data collection and data analysis etc.

Course Content

UNIT I 10 lectures

Scientific Approach to Research: Meaning, significance, variables

Research Process: Formulating the problem, objectives, hypothesis, Experimental design, sample design, collecting data, analysis of data, interpretation, preparation of report.

UNIT II 10 lectures

Sampling Techniques: Probability and non probability sampling.

Experimental designs: Randomized Block design

UNIT III 10 lectures

Measurements: measurement scale, Frequency distribution, graphical presentation of data.

Measures of Central Tendency: Mean, median and mode, their uses.

UNIT IV 15 lectures

Measures of variability: Mean deviations, Quartile deviation, standard deviation, their uses.

Correlation: Spearman and Pearson's techniques of correlation, Linear regression

UNIT V 15 lectures

Tests of significance of difference between means: t-test, F-test, One way ANOVA.

Applications to food quality assessments

Reference Books

- Aggarwal BL. 2003. Basic Statistics. New Age.
- Kothari CR. 1989. *Research Methodology*. Wiley Eastern.
- Gupta SP. 2004. *Statistical Methods*. S. Chand & Sons

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Skill Course FFT 230 : Industrial Training-II for 15 days

Credits: (0-0-4-2)

Level: Undergraduate

Semester: Spring

Pre-requisite: Any course in Food Processing

SEMESTER V

Skill Course FFT 321 : Principles of Food Engineering

Credits: (1-2-2-4)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on unit operations in food processing (FFT 328)

Objective

To acquaint with basic principle of Food Engineering and its Processes, with importance of various foods process and their evaluation.

Course Content

UNIT I 10 lectures

Process time calculations; Sterilizers and accessories used in canning industries; Engineering aspects of pasteurizer; homogenizer, evaporators (basic principle and single-effect evaporator) and concentrators used in food industries; Seaming machine.

UNIT II 8 lectures

Construction of cold storage; Different types of freezers including plate contact freezer, air blast freezer, cryogenic freezing and refrigerated vans.

UNIT III 9 lectures

Various types of driers (basic principle and drying time) – Tray drier, roller drier, spray drier, fluidized bed drier, freeze drier and solar drier.

UNIT IV 9 lectures

Heat exchangers (including paraflow HEs); Extruders – Basic principles and types, Difference between single- and twin-screw extruders; Kneader; Oil expeller

UNIT V 9 lectures

Advanced separation processes: Dialysis, ultrafiltration, reverse osmosis, electro dialysis and membrane separation.

Practical:

- Determination of viscosity of Newtonian fluid, Non Newtonian fluids;
- Determination of conductivity, calorific value and filtration properties of food& water.
- Calculation of freezing time for some typical foods
- Determination of Textural characteristics TPA of food product
- Evaluation of Bulk density and basics of true and bulk density

Reference books

- Fundamentals of Food Engineering by Stanley Charm.
- Introduction to Food Engineering - R. Paul Singh, Dennis R.
- Fundamentals of Food Process Engineering; Toledo RT; 2nd ed, 2000, CBS Publishers.
- Food process engineering, D.R. Heldman and R.P.Singh

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Elective Course FFT 351 : Post Harvest Management of Fruits and Vegetables

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: An introductory course on fruits and vegetables (FFT 333)

Objective

To acquaint with the proper handling technologies of fruits and vegetables to reduce post harvest losses and acquaint with principles and methods of preservation of fruits and vegetables into various products.

Course Content

UNIT I 6 lectures

Morphology, structure and composition of fruits and vegetables; maturity indices and standards for selected fruits and vegetables; methods of maturity determinations

UNIT II 8 lectures

Harvesting and handling of important fruits and vegetables, Field heat of fruits and vegetables and primary processing for sorting and grading; factors affecting post harvest losses; Standards and specifications for fresh fruits and vegetable.

UNIT III 8 lectures

Post-harvest physiological and biochemical changes in fruits and vegetables; ripening of climacteric and non-climacteric fruits; Storage practices: CA and MA, hypobaric storage, pre-cooling and cold storage; Commodity pretreatments - chemicals, wax coating, prepackaging and irradiation.

UNIT IV 4 lectures

Physiological post harvest disorders - chilling injury, freeze injury and disease.

UNIT V 4 lectures

Prevention of post harvest diseases and infestation; Handling and packaging of fruits and vegetables.

Practical

- Quality evaluation of raw vegetables
- MAP of fruits, Preparation of Products- Lemon Squash, Mango Soup
- Waxing of fruits
- Preservation of vegetables- Low Temperature, Determination of Preservative(KMS)

Reference Books

- Salunkhe DK, Bolia HR & Reddy NR. 1991. Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables. CRC.
- Thompson AK. 1995. Post Harvest Technology of Fruits and Vegetables. Blackwell Sci.
- Verma LR. & Joshi VK. 2000. Post Harvest Technology of Fruits and Vegetables. Indus Publ.

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Elective Course FFT 352 : Food Beverage Technology

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A basic course in Food Science (FFT 322)

Objective

In this the students will be exposed to the knowledge of beverage types and manufacturing process involved in different beverage manufacturing industries.

Course Content

UNIT I 6 lectures

Types of beverages and their importance; status of beverage industry in India;

UNIT II 4 lectures

Manufacturing technology for juice-based beverages; synthetic beverages; technology of still, carbonated, low-calorie and dry beverages; isotonic and sports drinks;

UNIT III 4 lectures

Specialty beverages based on tea, coffee, cocoa, spices, plant extracts etc.

UNIT IV 8 lectures

Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, , wine and related beverages, distilled spirits.

UNIT V 8 lectures

Packaged drinking water- definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, carbonated water.

FFT 422 Food Beverage Technology Practical

- Chemical and microbiological analysis of raw water quality;
- Preparation of regional fruit juices;
- Preparation of whey-based beverages;
- preparation of crush, nectar, blended juice
- Preparation of soy milk, fruit milkshakes, herbal beverages;
- Visit to relevant processing units.

Reference Books

- Srivastava RP & Kumar S. 2003. Fruit and Vegetable Preservation - Principles and Practices. International Book Distributors.
- Hardwick WA. 1995. Handbook of Brewing. Marcel Dekker.
- Hui YH. et al 2004. Handbook of Food and Beverage Fermentation Technology. Marcel Dekker.
- Priest FG & Stewart GG. 2006. Handbook of Brewing. 2nd Ed. CRC.
- Richard P Vine. 1981. Commercial Wine Making - Processing and Controls. AVI Publ.

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Elective Course: FFT 353 : Technology of Indigenous Milk Products

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on Dairy Technology/Food Science

Objective

To acquaint the students with the milk and milk based product preparations and the nutritional composition and health effect (good/bad).

Course Content

UNIT I 2 lectures

Status and significance of traditional milk products in India.

UNIT II 6 lectures

Khoa: Classification of types, standards methods of manufacture and preservation factors affecting yield of khoa. Physico-chemical changes during manufacture and storage of khoa. Confectioneries made from Khoa-Burfi, peda, Milkcake, Kalakhand, Gulabjaman and their compositional profile and manufacture practices.
Rabri and Basundhi: Product identification, process description, factors affecting yield physico-chemical changes during manufacture.

UNIT III 6 lectures

Channa: Product description, Standards method of manufacture, packaging and preservation.
Chhana-based sweets, Mechanization of manufacturing process.
Paneer: Product description standards method of manufacture packaging and preservation. Physico-chemical changes during manufacture and storage.

UNIT IV 7 lectures

Srikhand: Chakka product description, standards method of manufacture, small scale and industrial, packaging and preservation aspects. Physico-chemical changes and quality assurance during manufacture and storage.
Sandesh, Misti dahi: Product description method of manufacture and packaging process.
Kheer and Payasam: Product description methods of manufacture, innovations in manufacturing and packaging processes.

UNIT V 9 lectures

Microbiology of indigenous milk products: predominance of spoilage & pathogenic organisms in Curd, Khoa, Channa, Paneer, Shrikhand, control measures & legal specifications.
Biopreservative principles in enhancing the shelf-life ofindigenous milk products including active packaging.

FFT 366 Technology of Indigenous Milk Products Practical:

- Preparation of khoa from cow and buffalo milk.
- Preparation of chhana from buffalo milk.
- Preparation of paneer from buffalo milk.
- Analysis of khoa, chhanna and paneer for total solids, moisture, fat and acidity.
- Preparation of misti dahi, chhaka and srikhand.
- Microbiological examinations of traditional dairy products: Khoa, paneer, coliform counts, yeast and molds counts etc.

Reference Books

- Aneja RP, Mathur BN, Chandan RC & Banerjee AK. 2002. *Technology of Indian Milk Products*. Dairy India Publ.
- De S.1980. *Outlines of Dairy Technology*. Oxford Univ. Press.
- Rathore NS *et al.* 2008. *Fundamentals of Dairy Technology - Theory & Practices*. Himanshu Publ.

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Elective Course FFT 467: New Product Development and Sensory Science

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: An introductory course on Food quality and analysis (FFT 327)

Objective

To acquaint the students with the Sensory evaluation techniques and steps for the development of new food products.

Course Content

UNIT I (5 lectures)

Introduction to sensory analysis. Background and importance of Sensory Analysis, Definition of Sensory Analysis, Fields of Application of Sensory Analysis, Legislation on Sensory Analysis, Sensory perception and the organs of senses

UNIT II (6 lectures)

Methodology of sensory analysis, Preparation of trial, Location of test and tasting Rooms, Sensory evaluation techniques, Types of tests Differentiation sensory tests, Variables and scales, Descriptive sensory tests Affective sensory tests

UNIT III (7 lectures)

Assessors: Selection, training and monitoring, Assessors, Types of assessors, Factors influencing sensory evaluations, Features of assessors, Selection, training and monitoring of assessors: Recruitment, Selection, Training, Monitoring

UNIT IV (6 lectures)

Concept of product development - product success and failure, factors for success, process of product development, managing for product's success. Innovation strategy - possibilities for innovation, building up strategy, product development programme.

UNIT V (5 lectures)

The product development process - product strategy, product design and process development, product commercialization, product launch and evaluation.

Practical

- Selection and training of sensory panel
- Detection and threshold tests
- Ranking tests for taste, aroma colour and texture
- Sensory evaluation of various food products using different scales, score cards and tests
- Estimation of color and texture, Relationship between objective and subjective methods
- Idea and Concept generation for development of new product

Reference Books

- Meilgaard Morten; Sensory evaluation techniques Stone Herbert; Sensory evaluation practices. ISBN: 0-12-672690-6
- Schaffner, D. J., W. R. Schroeder e M. D. Earle; Food Marketing: An International Perspective - 2nd ed, McGraw Hill, 2003. ISBN: 978-0072952889

- Varela, P. e G. Ares; Novel Techniques in Sensory Characterization and Consumer Profiling, CRC Press , 2014. ISBN: ISBN 9781466566293

Skill Course FFT 322 : Waste Management and Effluent Treatment

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on hygiene and plant sanitation (FFT 320)

Objective

To acquaint the students with the major source of living ie water, its treatment, analysis and how to make it potable.

Course Content

UNIT I 5 lectures

Selection of sanitizing agents for cleaning, packaging sanitation, food storage sanitation, transport sanitation and water sanitation.

UNIT II 10 lectures

By-products obtained from cereals, pulses, legumes, oil seeds, fruit and vegetables, dairy plant, sugar and bakery, plantation crops and spices egg and poultry processing industry and meat, Fermentation industry.

UNIT III 5 lectures

Characterization of food industry wastes e.g., BOD, COD and total organic content, floatable and suspended solids in water.

UNIT IV 10 lectures

Pretreatment, secondary treatments of solid waste, sludge volume index, advanced techniques activated bio-filtration, biological fluidized bed reactor, dried bacteria culture process

UNIT V 15 lectures

tertiary treatments or advanced waste water treatment system (AWT); polishing ponds, DAF Techniques, micro trainers treatment and disposal of sludge, sand filters, removal of nitrogen, phosphorus, sulphur, physical chemical treatment process.

Reference Books

- Energy Conservation through Waste Utilization, American Society of Mechanical Engineers, New York.
- Kreit F & Goswami DY. 2008. Energy Management and Conservation Handbook. CRC Press.
- Murphy WR & Mckay G. 1982. Energy Management. BS Publ. Patrick DR. 1982.. Energy Management and Conservation. Elsevier Publ.
- Patrick DR., Fardo SW, Richardson RE & Steven 2006. Energy Conservation Guidebook. The Fairmont Press.
- Wulfinghoff DR. Energy Efficiency Manual. Energy Institute Press

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Skill Course FFT 323 : Food Laws and Regulations

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on Food science/processing

Objective

To acquaint with food quality parameters and control systems, food standards, regulations, specifications.

Course Content

UNIT I 3 lectures

Introduction and Need of enforcing to Food Laws.

UNIT II 12 lectures

Mandatory food laws; The food safety and standards Act 2006, Establishment of the authority, composition of authoring functions of chief executive officer, scientific part, General principles to be followed in

administration of act, General provisions as to articles of food, special responsibility as to safety of food, analysis of food offences of penalties.

UNIT III 15 lectures

Edible Oils Packaging (Regulation) Order, 1998, Environment (Protection) Act, 1986, Fruit Products Order, 1955 (FPO), Meat Food Products Order, 1973 (MFPO), Milk and Milk Product Order, 1992 (MMPO), Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1967.

UNIT IV 10 lectures

Standards of Weights and Measures Act, 1976, The Essential Commodities Act, 1955, The Export (Quality Control and Inspection) Act, 1963, The Insecticides Act, 1968, Vegetables Oil Products(Control) Order, 1998, Prevention of Food Adulteration Act & Rules (PFA Act), 1954 , Agmark Standards (AGMARK), Codex Alimentarius Standards, BIS Standards and Specifications, Consumer Protection Act, 1986.

UNIT V 5 lectures

Recommended international code of hygiene for various products.

Reference Books

- Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ

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Skill Course FFT 324 : Food Plant Design and Layout

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course of food processing unit operations (FFT 328)

Objective

To acquaint the students with the plant layout operation which is required by all industries to check their comparative factors as equipment position raw material handling and end product delivery

Course Content

UNIT I 5 lectures

Introduction : Plant design concepts - situations giving rise to plant design problems - differences in design of food processing and non-food processing plants

UNIT II 10 lectures

General design considerations, Food Processing Unit Operations, Prevention of Contamination, Sanitation, Deterioration, Seasonal Production, Flow Chart for Plant Design, Identification Stage, Looking for a need, Finding a product, Preliminary Screening of ideas, Comparative rating of product ideas: Present Market, Market Growth potential, Costs, Risks,

UNIT III 15 lectures

Plant location: Introduction, Location Decision Process, Factors involved in the plant location decision, Subjective, Qualitative and Semi-Quantitative Techniques

UNIT IV 5 lectures

Food Plant Utilities: Process Water, Steam, Electricity, Plant Effluents.

UNIT V 10 lectures

Plant layout : Importance, Flow Patterns, Basic Types of plant layouts, Product or line layout, Process or functional layout, Cellular or group layout, and Fixed position layout, Plant Layout factors, Layout design Procedure., Maintenance of Food Plant Building

Reference Books

- Peters, M.s and Timmerhaus, K.D, Plant Designs and Economics for Chemical Engineers, 4th Edition McGraw Hill,1991
- Biegler L.,grossmann I.E.and Westeberg A.W., Systematic Methods of Chemical Engineering and Process Designs, prentice Hall ,1997.
- Z. B. Maroulis and G. D. Saravacos, Food Process Design, Marcel Dekker 2003.

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General Education Course FFT 301 : Disaster Management

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To familiarize the students with the concept of disaster, how to response to disaster and field work to access the cause.

Course Content

UNIT I 10 lectures

Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and Local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

UNIT II 10 lectures

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT III 5 lectures

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction.

UNIT IV 10 lectures

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.

UNIT V 10 lectures

Field work / Case studies Hazard mapping of vulnerable areas, Vulnerability assessment (physical, social, organizational, economical, technological) Risk mitigation planning for vulnerable areas.

Reference Books

- Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
- Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.
- Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.

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General Education Course FFT 302 : Food Storage and Logistic Management

Credits: (3-0-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: An Introductory course on management (FFT 309)

Objective

To disseminate the knowledge of storage technique to increase the shelf life of food and logistics Management

Course Content

UNIT I 10 lectures

Concept of Logistics: Introduction, Objectives, Concept of Logistics, Objectives of logistics, Types of logistics, Concept of Logistics Management, Evolution of Logistics, Role of Logistics in an Economy, Difference between Logistics and Supply Chain Management, Logistics and Competitive Advantage, Logistics Mix, Logistics in Organised Retail in India

Integrated Logistics: Introduction, Objectives, Concept of Integrated Logistics, Inventory flow, Information flow, Operational Objectives of Integrated Logistics, Barriers to Integration, Organisation structure, Measurement system, Inventory ownership, Information technology, Knowledge transfer capability, Logistical

Performance Cycle, Logistics performance cycle, Manufacturing support performance cycle, Procurement performance cycle

UNIT II 10 lectures

Inventory Management: Introduction, Objectives, Concept of Inventory, Types of Inventory, Concept of Inventory Management, Importance of inventory management, Objectives of inventory management, Different Types of Inventory Costs, Inventory Performance Measures, Inventory turnover ratio (ITR), Framework of performance indicators, Inventory Planning Measures, Economic order quantity (EOQ), Reorder point, Safety stock, Supplier-managed inventory

Material Handling: Introduction, Objectives, Concept of Material Handling, Objectives of material handling, Principles of material handling, Equipment Used for Material Handling, Points to be Considered While Handling Materials, Role of Material Handling in Logistics

UNIT III 10 lectures

Material Storage System: Introduction, Objectives, Concept of Material Storage System, Unit Load Storage, Storage principles, Storage design and its benefits, Storage Methods

Storehouse Operations and Control: Introduction, Objectives, Storehouse Operations and its Objectives, Daily Activities of Stores, Organising a Store, Store Location and Layout, Selecting appropriate storage system, Centralisation, Decentralisation and variety reduction of stores, Store Housekeeping, Stores Accounting

UNIT IV 5 lectures

Logistical Packaging: Introduction, Objectives, Concept of Logistical Packaging, Design Consideration in Packaging, Types of Packaging Material, Packaging Costs

Transportation: Introduction, Objectives, Transportation System, Transportation Infrastructure, Different Modes of Transportation, Freight Management, Factors Affecting Freight Cost, Transportation Network, Containerisation

UNIT V 10 lectures

Customer Service: Key Element of Logistics: Introduction, Objectives, Concept of Customer Service, Attributes of customer service, Different phases of customer services, Customer Service for Competitiveness, Value-Added Logistical Service

Logistics Outsourcing: Introduction, Objectives, Concept of Logistics Outsourcing, Catalyst for logistics outsourcing, Benefits of logistics outsourcing, Issues in logistics outsourcing, Third-Party Logistics, Fourth-Party Logistics, Selection of Logistics Service Provider, Logistics Service Contract, Outsourcing-Value Proposition

Logistics Information System: Introduction, Objectives, Concept of Logistics Information System (LIS), Importance of LIS, Principles of designing LIS, Logistics Information Architecture, Application of Information Technology in Logistics and Supply Chain Management

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General Education Course FFT 303 : Introductory Biotechnology

Credits: (2-0-2-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course on basic microbiology (FFT 323)

Objective

To acquaint the students with the fundamental of bio-technology, industrial microbiology and fermentation processes.

Course Content

UNIT I 10 lectures

Prospectus of biotechnology- definition, scope and importance, DNA structure, function and metabolism.

UNIT II 5 lectures

GMO, genetic recombination mechanisms and technique used for improvement in microbial strains; Methods of recombinant DNA technology; Nucleic acid hybridization; Plant and animal cell and tissue culture techniques and their applications.

UNIT III 10 lectures

Molecular markers and their applications; DNA sequencing; Genetic engineering and transgenics; Genomics, transcriptomics and proteomics.

UNIT IV 10 lectures

General application of biotechnology in food industry, pharmaceuticals and agriculture Public perception of biotechnology; Bio-safety and bioethics issues.

UNIT V 10 lectures

Introduction to nanotechnology, history and recent developments, sources of nanoparticles, microbial production of nanoparticles, advantages of microbial nanoparticles and their applications.

FFT 303 Introductory Biotechnology Practical

- Isolation of genomic DNA from different sources
- Gel electrophoresis techniques
- Restriction enzyme digestion, ligation, transformation and screening of transformants
- Demonstration of PCR

Reference Books

- Becker JM, Coldwell GA & Zachgo EA. 2007. Biotechnology – a Laboratory Course. Academic Press.
- Brown CM, Campbell I & Priest FG. 2005. Introduction to Biotechnology. Panima Pub.
- Gupta PK. 2004. Biotechnology and Genomics. Rastogi Publications.
- Sambrook J, Fritsch T & Maniatis T. 2001. Molecular Cloning – a Laboratory Manual. 2nd Ed. Cold Spring Harbour Laboratory Press.
- Singh BD. 2007. Biotechnology Expanding Horiozon. Kalyani Publishers
- Fundamentals of Biotechnology, Prave. P. Faust, V. Sitih. W., Sukatsh, DA, 1987. ASM press.

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General Education Course: FFT 304 : Agribusiness Management

Credits: (2-1-0-3)

Level: Undergraduate

Semester: Autumn

Pre-requisite: A course in business management (FFT 309)

Objective

To provide the knowledge to students about the raw material collection management, organizational behavior and managerial accounting and PEM (project engineering management)

Course Content

UNIT I 5 lectures

Organizational Behaviour and Human Resource Management- The agribusiness system; management processes, planning, controlling, organizing, motivating and leading; decision making; managerial skills; level of managers; organizational context of decisions; decision making models; management by objectives; organizational culture; management of organizational conflicts; managing change; leadership styles; group dynamics; motivation.

UNIT II 10 lectures

Managerial Accounting and Control Financial Accounting- Meaning, Need, Concepts and Conventions; Advantages and Limitations and Standards of financial accounting;. Cost Accounting – Significance of Cost Accounting; Classification of Cost; Marginal Costing and cost volume profit Analysis- Its Significance, Uses and Limitations; Standard Costing – Its Meaning, Uses and Limitations; Determination of Standard Cost, Variance Analysis- Material, Labour and Overhead.

UNIT III 10 lectures

Project Management and Entrepreneurship Development Concept, characteristics of projects, types of projects, project identification, and Project's life cycle; Project feasibility- market feasibility, technical feasibility, financial feasibility, and economic feasibility, social cost-benefit analysis, project risk analysis; Network Methods; Project scheduling and resource allocation; Financial appraisal/evaluation techniques; Project control and information system. Entrepreneurship, Significance of entrepreneurship in economic development qualities of entrepreneur, entrepreneurship development programs and role of various institutions in developing entrepreneurship, life cycles of new business, environmental factors affecting success of a new business, reasons for the failure and visible problems for business, Developing effective business plans, Procedural steps in setting up of an industry.

UNIT IV 10 lectures

Linear Programming: Objective, Assumptions, Formulation of Linear Programming Problem, Graphic Method, Simplex method; Transportation and Assignment Problems; Inventory control Models, Costs Involved in Inventory Management, Types of Inventory; Waiting Line Models: Waiting Line Problem, Characteristics of a Waiting Line System; Decision making under Risk and uncertainties, Decision problem; Game Theory - Two - Person Zero-Sum Game; Simulation; Network analysis –PERT & CPM.

UNIT V 10 lectures

Agribusiness – definition and nature, components of agribusiness management, changing dimensions of agricultural business. Emerging trends in production, processing, marketing and exports; policy controls and regulations relating to the industrial sector with specific reference to agro-industries.

Agribusiness policies- concept and formulation; and new dimensions in Agri business environment and policy. Agricultural price and marketing policies; public distribution system and other policies.

Reference Books

- Martand T. Telsang, S. Chand Industrial & Business Management
- J Tony Arnold & Stephen N. Chapman, Pearson Education Asia Introduction to Materials Management
- Adam, Pearson Education /PHI Production & Operations Management
- Sinha, Pearson Education Asia Industrial Relations, Trade Unions &Labour Legislation
- Tulsian, Pearson Education Asia Business Organisation& Management

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FFT 330: Seminar (0-0-4-2)

SEMESTER-VI

Skill Course FFT 325 : Quality Assurance and Certification

Credits: (3-0-0-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course of food Quality and Analysis (FFT 327)

Objective

To acquaint the students with the certifications involved in raw material food and industries and different organizational system such as HACCP, GMP/GHP and auditing and surveillance.

Course Content

UNIT I 5 lectures

Quality inspection, quality control, quality management and Quality Assurance.

UNIT II 10 lectures

Total quality management; Good Manufacturing Practices, Good Agricultural Practices, Good Laboratory Practices, Quality Management systems QSS. Quality Circles, SQC.,

UNIT III 10 lectures

ISO System. HACCP, Principles, Implementation.

UNIT IV 5 lectures

Plan of Documentation, types of records.

UNIT V 15 lectures

Auditing, Surveillance; Audit, Mock audit, third party quality certifying audit, Auditors and Lead auditors. Certification, Certification procedures, Certifying bodies, Accrediting bodies, International bodies.

Reference Books

- Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.
- Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ

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General Education Course FFT 305 : Computer Applications in Food Technology

Credits: (3-1-0-4)

Level: Undergraduate

Semester: Spring

Pre-requisite: An introductory course on computer applications (FFT 307)

Objective

To acquaint the students for the familiarization of application of computer in food industries.

Course Content

UNIT I 10 lectures

Importance of Computerization and IT in Food Industries Computers, operating environments and information systems for various types of food industries. Principles of Communication.

UNIT II 10 lectures

Role of Computer in Optimization: Introduction to operation Research A Computer Oriented Algorithmic approach; Queuing systems and waiting models; PERT, CPS and CPM.

UNIT III 10 lectures

Food Process Modeling and Simulation; CAD and CAM in Food Industry: instrumentation, process Control, inventory Control, Automation, Robotics, Expert system and artificial intelligence.

UNIT IV 10 lectures

Practical Applications of MS Excel to solve the problems of food technology: Statistical quality control, Sensory evaluation of food, and Chemical kinetics in food processing; Use of word processing software for creating reports and presentation.

UNIT V **2**0 lectures

Familiarization with the application of computer in food industries -Milk plant, Bakery Units, Fruit & Vegetable processing Unit.

Familiarization with software related to food industry. Ergonomics application in the same; Visit to Industry and case study problems on computer.

Reference Books

- Gillett BE. Introduction to Operation Research (A Computer Oriented Algorithmic Approach).
- Groover MP & Zimmers EW. 1987. CAD/CAM: Computer Aided Design and Manufacturing. Prentice Hall.
- Singh RP. 1996. Computer Applications in Food Technology. Academic Press.

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General Education Course FFT 319 : Human Values and Ethics

Credits: (3-0-0-3)

Level: Undergraduate

Semester: Spring

Pre-requisite: 10+2 science examination with PCB/PCBM/PCM/10+2 Agriculture

Objective

To acquaint the students with the ethics involve in environmental protection, IPR and safe guarding heatlh of consumer.

Course Content

UNIT I 5 lectures

The importance and the needs of ethics; Ethical business practices; Laws and ethics; Environmental protection;

UNIT II 5 lectures

Creating awareness and safeguarding health of consumers; Fair trade practices.

UNIT III 12 lectures

Concept of property, rights, duties and their correlation; History and evaluation of IPR; Copyrights and related rights. Distinction among various forms of IPR.

UNIT IV 12 lectures

Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical indication and Industrial design.

UNIT V 11 lectures

International Registration systems; WIPO treaties; Unfair competition; Protection of new plant varieties; Legal implications and public concerns in genetic modification of foods; National policies on food security.

Reference Books

- Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
- S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
- M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.
- Agochiya D. 2002. Every Trainer's Handbook. Sage Publ.
- David Gross. 1997. Human Resource Management - The Basics. TR Publ.
- Davis Keth & Newston W John 1989. Human Behaviour at Work. 8th Ed. McGraw-Hill.
- Lynton RP & Pareek U. 1993. Training for Development. DB. Taraporewale Sons & Co.

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General Education Course FFT 320 : Project Management and Entrepreneurship

Credits: (3-2-0-5)

Level: Undergraduate

Semester: Spring

Pre-requisite: A course on business management (FFT 309/FFT 317)

Objective

To acquaint the students with the performance evaluation and review techniques and critical path method to solve the industrial problems.

Course Content

UNIT I 15 lectures

Definition of Entrepreneurship given by various economists, the conceptual model of Entrepreneurship. Entrepreneur and Manager, Enterprise and Entrepreneur. Managing Creativity Issues to be addressed in working the definition of creativity, Attributes of a creative person, Creative Thinking and Motivation.

UNIT II 15 lectures

Composition of Small Business, Economic Contribution of Small Business. Strategic Planning for Small Business, Steps in Strategic Planning -Conduct a thorough Market Segment Analysis, Formulate Strategic Options and Select appropriate Strategies (Focus, Cost leadership & Differentiation), Why Strategic Planning fails in Small Business.

UNIT III 8 lectures

Forms of Ownership: Sole Proprietorship, Partnership &Corporation form of Organisation -Advantages and Disadvantages, Franchising- What is Franchising -Advantages and Disadvantages to Franchising - Franchise Evaluation Checklist –Franchise contracts -Types of Franchise arrangements.

UNIT IV 20 lectures

Project creation, significance of infrastructure in economic development, Project Identification, Idea generation, Project screening, Feasibility study. The advantages and disadvantages of starting your business, Financial Record Keeping – Profit Planning & Cost Control, Project costing : Breakdown structure of the project, cost estimation of the project, factor affecting the cost of the project, Costing with alternative configurations/specifications.

UNIT V 17 lectures

Traditional sources of financing, Equity shares, preference, shares, Debentures/bonds, loan from financial institutions- Loan syndication and consortium finance; Alternative sources of financing, Franchising etc; Role played by various Financial Institutions like IDBl, ICICI and IFCI etc. Project insurance, Human resource management, network analysis.

Reference Books

- Chandra P. 2005. Project Management. Tata McGraw Hill.
- Gopal Krishan P & Nagarajan K. 2005. Project Management. New Age.
- Hisrich RD & Peters MP. 2002. Entrepreneurship. Tata McGraw Hill.
- Kaplan JM. 2003. Patterns of Entrepreneurship. John Wiley & Sons.
- Nandan H. 2007. Fundamentals of Entrepreneurship Management. Prentice Hall

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FFT 340 : Project Work for 3 months (0-0-30-15)