



**KALINGA
UNIVERSITY**

SCHEME & SYLLABUS FOR

Bachelor of Vocational Studies (B.Voc.) Food Processing Technology



Kalinga University, Naya Raipur, Chhattisgarh

B.VOC IN (FOOD PROCESSING TECHNOLOGY)

Semester-01								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT101	Communication Skills	3	3	0	0	30	70	100
BVFPT102	Fundamentals of Information Technology	3	3	0	0	30	70	100
BVFPT103	Introduction to Food Processing and Preservation Technology	3	3	0	0	30	70	100
BVFPT104	Fundamentals of Food Science	3	3	0	0	30	70	100
BVFPT105P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-02								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT201	Fundamentals of Nutrition	3	3	0	0	30	70	100
BVFPT202	Environmental Studies	3	3	0	0	30	70	100
BVFPT203	Food Biochemistry	3	3	0	0	30	70	100
BVFPT204	Fruit and Vegetable Processing Technology	3	3	0	0	30	70	100
BVFPT205P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-03								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT301	Food Microbiology	3	3	0	0	30	70	100
BVFPT302	Bakery and Confectionary Technology	3	3	0	0	30	70	100
BVFPT303	Applied Nutrition	3	3	0	0	30	70	100
BVFPT304	Technology of Food-I	3	3	0	0	30	70	100
BVFPT305P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-04								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT401	Food Process Equipment Design	3	3	0	0	30	70	100
BVFPT402	Food Preservation Technology	3	3	0	0	30	70	100
BVFPT403	Food Toxicology and Allergy	3	3	0	0	30	70	100
BVFPT404	Technology of Food-II	3	3	0	0	30	70	100
BVFPT405P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-05								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT501	Milk and Milk Products Processing	3	3	0	0	30	70	100
BVFPT502	Processing and Preservation of Agro based foods	3	3	0	0	30	70	100
BVFPT503	Food Extrusion Technology	3	3	0	0	30	70	100
BVFPT504	Food Packaging Technology	3	3	0	0	30	70	100
BVFPT505P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester-06								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total Marks
BVFPT601	Emerging Technologies in Food Processing	3	3	0	0	30	70	100
BVFPT602	Food additives and Preservatives	3	3	0	0	30	70	100
BVFPT603	Food Safety and Quality Control	3	3	0	0	30	70	100
BVFPT604	Food Industries Waste Management	3	3	0	0	30	70	100
BVFPT605P	Industrial Training/ On Job Training/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

SEMESTER-01

BVFPT101

COMMUNICATION SKILLS

Course Objective:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course outcomes:

- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication
- To develop vital communication skills which should be integral to personal, social and professional interactions.
- One of the critical links between human beings.
- An important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal.
- In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Unit - 1

06

Introduction: Theory of communication, types and modes of communication, mediums and channels of communication, barriers to communication, English as a global language, the lingua franca, social influences on English

Unit - 2

06

Language of Communication: Verbal and non-verbal (spoken and written) personal, social and business barriers and strategies intra-personal, inter-personal and group communication, varieties of English, language, accent, dialect, colloquialism, historical influences on English

Unit - 3

06

Speaking Skills: Monologue dialogue group discussion effective communication/ mis-communication interview public speech, regional influences on English, convergence and divergence, linguistic imperialism

Unit - 4

06

Reading and Understanding Close reading, reading analysis of a text - audience and purpose, content and theme, tone and mood, stylistic devices, structure comprehension- analysis and interpretation translation (from Indian language to English and vice-versa) literary/knowledge texts

Unit - 5

06

Writing Skills: Documenting report writing making notes letter writing, writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters it will enhance language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc. while, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. it is hoped that after studying this course, students will find a difference in their personal and professional interactions.

References:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brati Biswas

BVFPT102

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course objective:

This is a basic course for commerce students to familiarize with computer and its applications in the relevant fields and exposes them to other related courses of IT.

Course Outcomes:

- Gain a foundational understanding of key IT concepts, including hardware, software, and networks.
- Develop proficiency in using common computer applications, such as word processing and spreadsheet software.
- Explore the ethical and security considerations in IT, emphasizing responsible digital behaviour.
- Acquire problem-solving skills by applying IT knowledge to real world scenarios.
- Prepare for further studies in IT or related fields by establishing a strong IT knowledge base.

Unit - 1

06

Computer characteristics: Speed, storage, accuracy, diligence; digital signals, binary system, ASCII; historic evolution of computers;

Classification of computers: microcomputer, minicomputer, mainframes, supercomputers;

Personal computers: desktop, laptops, palmtop, tablet; hardware & software; von Neumann model.

Unit - 2

06

Hardware: CPU, memory, input devices, output devices.

Memory units: RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory;

Auxiliary storage: Magnetic devices, optical devices; floppy, hard disk, memory stick, CD, DVD, CD/DVD-Writer;

Input devices - keyboard, mouse, scanner, speech input devices, digital camera, touch screen voice input, joystick, optical readers, bar code reader;

Output devices: Display device, size and resolution; CRT, LCD, LED;

Printers: Dot-matrix, inkjet, laser; plotters, sound cards & speaker.

Unit - 3

06

Software: System software, application software; concepts of files and folders, introduction to operating systems, different types of operating systems: single user, multitasking, time-sharing multi-user; booting, POST;

Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases;

Application software: Generic features of word processors, spread sheets and presentation software; generic introduction to latex for scientific typesetting; utilities and their use; computer viruses & protection, free software, open source.

Unit - 4

06

Computer Networks and Internet: Connecting computers, requirements for a network: server, workstation, switch, router, network operating systems; internet: brief history, world wide web, websites, URL, browsers, search engines, search tips; internet connections: isp, dial-up, cable modem, well, dsl, leased line wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, web pages, web programming languages.

Unit - 5

06

Information Technology and Society: Indian IT Act, intellectual property rights, issues. application of information technology in railways, airlines, banking, insurance, inventory control, financial systems, hotel management, education, video games, telephone exchanges, mobile phones, information kiosks, special effects in movies.

Programming Concepts & Techniques: Program concept, characteristics of programme, stages in program development, tips for program designing, programming aids, algorithms, pseudo code, notations, design, flowcharts, symbols, rules, compiler & interpreter. introduction to programming techniques, top-down & bottom-up approach, unstructured, & modular programming, cohesion, coupling, debugging, syntax & logical errors, linking and loading, testing and debugging, documentation.

References:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

BVFPT103

INTRODUCTION TO FOOD PROCESSING AND PRESERVATION TECHNOLOGY

Unit - 1	08
Introduction to Food constituents, viz. carbohydrates, lipids, proteins, vitamins and minerals. Types and Causes of food spoilage	
Unit - 2	08
Food preservation principles and methods; Physical, Chemical and Biological; Physical: Drying, evaporation, canning and process time evaluation, irradiation, refrigeration and freezing	
Unit - 3	07
Chemical and Biochemical means of preservation viz. by addition of salt, sugar, oil spices and preservative; fermentation etc.	
Unit - 4	07
Introduction to food packaging, Introduction to hygienic aspect in food handling and processing	

References:

1. Food Science, N. N. Potter, CBS Publisher & Distributors
2. Foods, Facts & Principles, N. S. Many & M. Shadakshara swamy, New Age International (p) Ltd., New Delhi.
3. Technology of food preservation, Desrosier & Desrosier, CBS Publishers & Distributors, New Delhi.
4. Food Science, B. Sri lakshmi, New Age International (p) Ltd., New Delhi.

BVFPT104

FUNDAMENTALS OF FOOD SCIENCE

Course Objective:

Understand the basic concept, functions, and classification of food.

Unit - 1

08

Introduction to food science:

- Concept of food, food science
- Objectives of food science
- Classification and Functions of food

Unit - 2

08

Cereals:

- Structure, composition and Importance of cereal grains
- Types of cereals used in cooking
- Cereal cookery- Gelatinization, Dextrinization and Identity of grain
- Processed cereals, millets and Ready-To- Eat cereals used in cooking

Unit - 3

07

Pulses and Legumes:

- Definition, composition and structure of pulses
- Cooking of Legumes and Factors Affecting cooking time of pulses and legumes
- Uses of legumes in cookery

Unit - 4

07

Fruits and Vegetables Cookery:

- Classification of Fruits and vegetables
- Colour pigments in Fruits and vegetables
- Effect of heat, acids and alkali on Fruits and vegetables
- Changes during cooking and storage

References:

1. B. Shreelakshmi : ``Food Science'' (second edition), New Age International, New Delhi.
2. Swaminathan : ``Text book of Food Science'', Vol-1, BAPPCO, Bangalore
3. Devendrakumar Bhatt & Priyanka Tomar : An Introduction to Food Science, Technology & Quality Management, Kalyani Publishers.
4. Sumati R. Mudambi : Fundamentals of Food & Nutrition wiley Eastern Ltd., New Delhi.
5. Philips T E, Modern Cooking for teaching and trade, Volit orient longman, Bombay

BVFPT105P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-02

BVFPT201

FUNDAMENTALS OF NUTRITION

Course Objectives:

- To understand the concept of nutrients
- To study the role of various nutrients

Unit - 1

08

Introduction to Nutrition:

- Definition of nutrition, nutrients, RDA
- Classification of nutrients (Macro, Micro)

Unit - 2

08

Macro nutrients (Carbohydrates, Proteins, Fats):

- Classification, Sources
- Functions, RDA
- Deficiency, excess

Unit - 3

07

Micro nutrients (Vitamins, Minerals):

- Classification, Sources
- Functions, RDA
- Deficiency, excess

Unit - 4

07

Water:

- Composition, Sources, Classification
- Functions, RDA
- Deficiency, excess

References:

1. Shubhangini Joshi, Textbook of food and nutrition, Tata Macgrohill Publishing Co., New Delhi.
2. B. Shrilakshmi, Nutrition Science, New Age International Publishers
3. Muddambi S.R. and Rajgopal M. V., Fundamentals of Food and Nutrition, Wiley Eastern Ltd., New Delhi.
4. Nutritive Value of Indian Foods, NIN, Hyderabad.

BVFPT202

ENVIRONMENTAL STUDIES

Course Outcomes:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

Unit - 1

06

Introduction to Environmental Studies:

- Multidisciplinary nature of environmental studies, Scope & importance; concept of sustainability & sustainable development.

Ecosystems:

- What is an ecosystem? Structure and function of the ecosystem;
- **Energy flow in an ecosystem:** food chains, food webs and ecological succession.
- **Case studies of the following ecosystems:** Forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit - 2

06

Natural Resources:

- **Renewable and Non-renewable Resources:** Land resources and land use change; Land degradation, soil erosion and desertification
- **Deforestation:** Causes & impacts due to mining, dam building on environment, forests, biodiversity & tribal populations
- **Water:** Use & over-exploitation of surface & ground water, floods, droughts, conflicts over water (international & inter-state)
- **Energy resources:** Renewable & non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies

Unit - 3

06

Biodiversity and Conservation:

- **Levels of biological diversity:** genetic, species & ecosystem diversity; Biogeographic zones of India; Biodiversity patterns & global biodiversity hot spots, India as a mega-biodiversity nation; Endangered & endemic species of India
- **Threats to biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;
- **Conservation of biodiversity:** In-situ and Ex-situ conservation of biodiversity.
- **Ecosystem and biodiversity services:** Ecological, economic, social, ethical, aesthetic and Informational value.

Unit - 4

06

Environmental Pollution:

- Types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks
- **Solid waste management:** Control measures of urban and industrial waste. Pollution case studies.

Environmental Policies & Practices:

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- **Environment Laws:** Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit - 5

06

Human Communities and the Environment:

- **Human population growth:** Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies.
- **Disaster management:** floods, earthquake, cyclones and landslides.
- **Environmental movements:** Chipko, Silent valley, Bishnois of Rajasthan.
- **Environmental ethics:** Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

References:

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36--37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29--64). Zed Books.
8. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
14. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

BVFPT203

FOOD BIOCHEMISTRY

Course Outcomes:

- Understand the role of water in biological system.
- Illustrate the fundamentals of carbohydrates.
- Acquire the details of protein.
- Discuss the fundamentals of fats.
- Describe the basics of vitamins and minerals.

Unit - 1

06

Water: Bound water, free water, colloid, gels, emulsions and foams. Water activity (Concepts, Methods for measuring). Distribution of water in various foods and moisture determination.

Unit - 2

06

Carbohydrates: Classification and structure of Carbohydrates, Sources of carbohydrates, Physico-chemical and functional properties, (reaction with phenyl hydrazine, NH_2OH , oxidation, reduction, ring formation); Basic concepts of Starch, cellulose, Glycogen, Pectin, Agar-agar, Gum Arabic; Reducing and nonreducing sugar: concept and their estimation. Basic idea about Gelatinization, Gel formation, Retrogradation, Crystallization, Caramelization, Maillard reaction.

Unit - 3

06

Proteins: Classification of amino acid, Sources and physico-chemical and functional properties of proteins; structure of protein; protein denaturation; Common food proteins. Protein determination methods, Separation of amino acid by chromatographic method

Unit - 4

06

Fats/ Lipids: Fatty acids concepts, classification; essential fatty acids, cis and trans fats; physico chemical and functional properties; Defects (rancidity) and their prevention; Chemical constants of fats (acid value, per-oxide value, Saponification number, Iodine value, Reichert-Meissl number); Basic idea about plasticity, hydrogenation, winterization; fats estimation by solvent extraction method

Unit - 5

06

Minerals and Vitamins: Sources and physiological functions of minerals & vitamins; deficiency disorder; Effect of processing and storage of vitamins, Pro vitamins A & D; Vitamins as antioxidants.

References:

1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi.
2. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy /New Age International
3. Food Science / N.N. Potter
4. Food Chemistry / L. H. Meyer
5. Food Analysis & Practice / Y. Pamaranz / AVI
6. Text Book of Biochemistry / Webb, Todd, Mason
7. Food Science / B. Srilaxmi / New Age international
8. Principles of Food Science / Karek & L.M. Delker

BVFPT204

FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

Course Outcomes:

- Study the agricultural aspects of vegetables and fruits.
- Illustrate the physiological characteristics of fresh fruits and vegetables
- Explain the freezing and dehydration techniques of fruits and vegetables
- Describe the general canning techniques to process purees and juices
- Discuss the preparation procedures of fruits and vegetables products

Unit - 1

06

Basic agricultural aspects of vegetables and fruits: Ability to identify all commercially important fruits and vegetables with their names season, Morphology, structure and composition of fruit and vegetable. Production and processing scenario of fruits and vegetable. Scope of Fruit and Vegetable Preservation Industry. Present status, constraints and prospectus.

Unit - 2

06

Fresh fruits and vegetables: Physical, Textural characteristics, structure and composition. Maturity standards; Importance, methods of maturity determinations maturity indices for selected fruits and vegetables. Harvesting of important fruits and vegetables. Fruit ripening- chemical changes, regulations, methods.

Storage practices: Control atmospheric, Bead atmosphere, hypotactic storage, cool store, Zeroemerge cool chamber, stores striation. Commodity pre-treatment's - chemicals, wax coating, pre-packaging, phytonutrients in fruits and vegetables grading, cleaning, Physiological postharvest diseases chilling injury and disease. Handling and packaging of fruits and vegetables

Unit - 3

06

Freezing and dehydration of fruits and vegetables: General preprocessing, different freezing methods and equipments, problems associated with specific fruits and vegetables; Dehydration – General preprocessing, different methods of drying including sun, tray, spray drying and low temperature, osmotic dehydration and other modern methods;

Unit - 4

06

Canning, purees and juices: Canning- General preprocessing, specific or salient points in fruits and vegetables like Blanching, exhausting, processing conditions; Indian Food Regulation and Quality assurance Fruit Juice / pulp/ Nectar/Drinks, concentrates – General and specific processing, different packing including aseptic. Vegetable Purees/ pastes -General and specific processing, different packing including aseptic.

Unit - 5

06

Fruit and vegetable products: Ready to eat fruit and vegetable products, Jams/Marmalades, Squashes/ cordials, Ketchup/sauces, Chutneys, Fruit Bar, Soup powders, Candied Fruits, Natural colors, Fruit and Vegetable Fibres- General and specific processing, different packing including aseptic, Potato: Wafer; starch, Papad, Carrot: Preserve, candy, Pickle, Jam. Cauliflower and cabbage: Dried cauliflower and cabbage, Sauerkraut.

References:

1. Fellows, P.J. "Food Processing Technology: Principles and Practice", 2nd Edition, CRC/Woodhead, 1997.
2. Sivasankar, B. "Food Processing & Preservation", Prentice Hall of India, 2002.

BVFPT205P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-03

BVFPT301

FOOD MICROBIOLOGY

Course Outcomes:

- Study the details of waste treatment of parameters and stream pollution
- Describe the basics of waste treatment
- Illustrate the details of waste treatment units
- Acquire the knowledge of industrial waste treatment
- Discuss the source and characteristics of solid waste treatments

Unit - 1

06

Waste Treatment Parameters: Constituents of suspended solids, volatile suspended solids, MLVSS, BOD, COD, Dissolve oxygen, Analytical determination of BOD, COD and DO, Mathematical model for BOD, BOD curve.

Stream Pollution & Measurement: Nature of stream pollution, Oxygen sag curve, Oxygen sag equation and industrial problems based on oxygen sag equation.

Unit - 2

06

Fundamental of physical and chemical treatment: Objective of physical treatments, screening, flow equalization, mixing and flocculation, gravity separation, grit removal, sedimentation, Ideal sedimentation tank concept, high-rate clarification, flotation, aeration system (principle only). Objective of chemical treatments, chemical coagulation, chemical precipitation, chemical oxidation, neutralization and stabilization (Principle only).

Fundamentals of biological treatment: Objective of biological treatment, Types of biological process, Microbial growth kinetics, Substrate utilization kinetics, Aerobic biological oxidation, Biological nitrification and denitrification, Biological phosphorous removal, anaerobic biological oxidation, Biological removal of toxic, recalcitrant organic compound and heavy metals (No design principle only)

Unit - 3

06

Biological Treatment unit: Activated sludge process and advantage (No design), Rotating biological contractors and its advantage and disadvantage (No design), Aerated lagoon – principle, application, advantage, residence time in aerated lagoon, brief discussion on stabilization pond(no problem) Trickling filter (only principle, application, advantage) Facultative pond, Oxidation ditch, aerobic pond, Biofilters and Bioclarifiers Anaerobic suspended and attached growth biological treatment process- Anaerobic contact process, anaerobic sludge blanket process, attached growth anaerobic process, (principle, application,)

Unit - 4

06

Industrial Waste Treatment: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment, reuse and recycling. (Only principle, application,)

Unit - 5

Solid Waste Treatment: Source and characteristics of solid wastes, Preliminary operation, thickening, stabilization, anaerobic digestion, aerobic digestion, composting, Vermicomposting conditioning, dewatering, heat drying, incineration, disposal and landfilling. (Only principle, application,)

References:

1. Waste treatment engineering / H.J. Hammer
2. Waste treatment / Eddy & Metcalf .
3. Environmental Science / J. Turk & A. Turk
4. Environmental Pollution / Dix Pollution Control Acts, Rules and Notification / Central
5. Pollution Control Board, New Delhi
6. Wastewater engineering- Jain and Jain

BVFPT302

BAKERY AND CONFECTIONARY TECHNOLOGY

Course Outcomes:

- Study the ingredients of baking
- Discuss the details of baking techniques
- Describe the basics of baking equipments
- Illustrate the products of baking
- Explain the basics of confectionary technology

Unit - 1

06

Ingredients for Baking: Proximate composition of wheat, types of wheat, types and grades of flours, flour process, chemistry of flour, testing of wheat and flour for baking quality, Type & Mechanism of Gluten development. Major & minor ingredients used in baking (product wise) and their role in baking, Different baking ingredients and their role in baking - leavening agents (D.R.C, diastatic activity) , Shortening agents, emulsifiers ,antioxidants ,improver ,dough conditioner Quality of water used and its function in baking, impurities of water and their effect in quality of baked products. FSSAI/PFA limit for additives in bakery product.

Unit - 2

06

Baking Techniques: Bulk handling of ingredients, Process parameters, Various dough and their use, Fermentation and proofing, Mechanism of Heat transfer in baking, time, temperature humidity effect in baking, cooling and packaging of baked products.

Unit - 3

06

Baking equipments: Types, working principle &, application of -Dough mixer, dough moulding, dough divider, proofer, baking oven, cooler. Machines & equipment for batch and continuous processing of bakery products.

Unit - 4

06

Product of Baking: Production of bread, biscuits, cake, Pastry, cookies, crackers, pasta, noodles, pizza and their quality aspects, defects of baked products and preventive measures. Snack food product Packaging of bakery products. Canned bakery products. Freezing of bakery product.

Unit - 5

06

Confectionary Technology: Definition of Confectionary, Icing Technology, wafer manufacture, Fondant and Fudge, Manufacture of chocolate, production of chocolate mass, chocolate candy, chocolate based confectionary product, Milk based confectionary products, Different Sugar boiled stage, Sugar confectionaries, Sweet candy.

References:

1. Bakery & Confectionary Technology –By S.A.Matz.
2. Chocolate, Cocoa, Confectionary – By Minifie B.W.
3. Bakery Technology and Engineering –By S.A.Matz.
4. Equipments for Bakers –By S.A.Matz.
5. Cookies & Cracker Technology–By S.A.Matz.
6. Basic Baking- By S.C Dubey.
7. Textbook of Bakery and Confectionary – By Yogambal, PHI

BVFPT303

APPLIED NUTRITION

Course Outcomes:

- Describe the basics of enzymes
- Explain the process of carbohydrate metabolism.
- Acquire the knowledge of lipid metabolism.
- Discuss the fundamentals of protein metabolism.
- Illustrate the details of food additives.

Unit - 1

06

Enzymes: Concepts, Classification, Physico-chemical nature, Mechanism of enzyme action, Enzyme kinetics (MME and their transformations), Factors affecting enzyme activity, Enzyme inhibition, Enzymespecificity, Co-factors, Basic concepts on lysozymes & Isozymes, Enzyme unit, Turn over number, Allosteric enzyme.

Unit - 2

06

Carbohydrates metabolism: Metabolic pathways for breakdown of carbohydrates: Glycolytic pathway, Pentose phosphate pathway, Citric acid cycle, Electron transport chain, ATP balance, Gluconeogenesis.

Unit - 3

06

Lipids metabolism: Utilization of fats, biosynthesis of fatty acids and fats; Digestion & absorption of lipids; Ketone substances.

Unit - 4

06

Proteins metabolism: Metabolism of proteins (digestion and absorption); Nitrogen balance and nitrogen pool; Evaluation of quality of proteins, Urea cycle

Unit - 5

06

Food Additives: Basic concepts, general principles for the application. Examples & role play in food processing –Preservatives, Antioxidants, Emulsifiers, Stabilizers (Thickeners), Sequestering and buffering agents, Bleaching and maturing agents, Food colours, Nutrient supplements, Non-nutritive and special dietary sweeteners, Anti-caking agents, Foaming and anti-foaming agents, Leavening agents, Firming agents, Humectants and texturisers, Clarifying agents.

Food Pigments & Flavouring Agents: Importance, types and sources of pigments, their changes during processing and storages.

References:

1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi.
2. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International.
3. Food Science / N.N. Potter.
4. Food Chemistry / L. H. Meyer.
5. Food Analysis & Practice / Y. Pamaranz / AVI.
6. Text Book of Biochemistry / Webb, Todd, Mason.
7. Food Science / B. Srilaxmi / New Age international.

BVFPT304

TECHNOLOGY OF FOOD-I

Course Outcomes:

- Study the fundamentals of cereals
- Describe cereal processing and cereal products
- Illustrate the details of pulses and legumes
- Understand the basics of extruded foods
- Discuss fats and oil processing with products.

Unit - 1

06

Introduction to Cereals: Proximate composition of cereals, different types of cereals, general physiochemical structure of cereals, Storage of cereals, infestation control and use of pesticides, Toxic factors in cereals.

Unit - 2

06

Cereals Processing: Drying of cereals – solar, Ultra high temp. drying, Ultra low temp. drying, Milling of paddy and wheat, Parboiling of paddy, Classification of wheat, flour; difference between atta, suji and flour. Milling of corn and barley.

Cereal Products: Different cereal products, fermented cereal products, break first cereals products, macaroni product.

Unit - 3

06

Pulses and Legumes: Proximate composition of pulses and legumes, classification of pulses, Toxic constituents of pulses, processing and milling of pulses, different types of pulse product, Processed soybean products including fermented soya product.

Unit - 4

06

Extruded Foods: Objectives and importance of extrusion in food product development; Components and functions of an extruder; Classification of extruder; Advantages and disadvantages of different types of extrusion; Pre and post extrusion treatments; Manufacturing process of extruded products; Application of extrusion technologies in food industries. Texturized, vegetable protein product.

Unit - 5

06

Fats and oils processing: Introduction to oilseed, classification of oilseed, Extraction of fats and oil seeds –, rendering, pressing, solvent extraction; Processing of oils – degumming, refining, bleaching, deodorization, fractionation, winterization, hydrogenation, esterification, inter-esterification & emulsification.

Preparation of fats and oils-based products: Natural vegetable fat (margarine; vanaspati) and animal fat (butter, lard):- source, composition, properties and industrial applications; Plastic fat in bakery and confectionary; Preparation of shortenings and salad oil. Preparation of protein concentrate from oil seed, Standard and quality control of fats and fatty foods; By-products of fat/oil processing industries.

References:

1. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International.
2. Cereal Food Technology/NIIR Board, Asia pacific Business press.
3. Food Analysis & Practice / Y. Pamaranz / AVI.
4. Food Science / B. Srilaxmi / New Age international.
5. Principles of Food Science / Karek & L.M. Delker.
6. Advances in Pulse Production Technology, Jeswani and Baldev, ICAR.
7. Fundamentals of food engineering- D.G.Rao, PHI Learning.

BVFPT305P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-04

BVFPT401

FOOD PROCESS EQUIPMENT DESIGN

Course Outcomes:

- Study the details of material of construction
- Explain the basics of construction requirements
- Understand the design of pipes and pressure vessels
- Describe the design of supports
- Discuss the design of process equipments

Unit - 1

06

Introduction: Material of construction: Introduction to material selection; Material properties; Environmental effects on material selection; Mechanical properties & strength of materials.

Unit - 2

06

Construction Requirements: Design basis: Design code; Design pressure, stress & factor of safety, Corrosion allowance, Weldjoint efficiency factor, Design loadings, Criteria of failure.

Unit - 3

06

Design of Pipes and Pressure Vessels: Design of pipe and pipe fittings. Process vessels under internal and external pressure; Design of attachments and closures;

Unit - 4

06

Design of Supports: Design of flange connections & threaded fasteners; Design of supports; Bracket or Lug support, Skirt Supports.

Unit - 5

06

Design of Process Equipments: Process Design of double pipe heat exchanger, Shell & Tube Heat Exchanger, Design of Evaporator; Agitation Vessels and centrifugal separator, Design of Rotary Dryer.

References:

1. B.C.Bhattacharya.—Introduction to Chemical Equipment Design — Mechanical Aspects, CBS Publishers, Delhi.1991.
2. Anantha krishnan.C.P.and M.N.Sinha.—Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi,1997.
3. Groff, Gane K and Muthu, JohnF.,-Operations Management Selected Readings, D.B. Taraporevala Sons and Co, Bombay, 1975.
4. Thuesen, H.G., Febrycky, W.J. and Thuesen, G.J.,—Engineering Economy, Prentice–Hall Inc, NewJersey, 1978.

BVFPT402

FOOD PRESERVATION TECHNOLOGY

Course Outcomes:

- Discuss the fundamentals of canning technique.
- Illustrate the details of drying technique.
- Describe the details of refrigeration and freeze drying
- Illustrate the process of preservation by fermentation
- Explain the preservation process of preservatives and CA, MA storage

Unit - 1

06

Canning: General Canning technique can lacquer, can filling solution, Can construction, mechanical defects Effect of temperature, pH, and altitude on canning of various food Evaluation of process time by graphical (Bigelow method) and formula method Can defects, aseptic canning.

Unit - 2

06

Drying: Concept of drying, drying kinetics (no problem required) Different type of driers – solar, tray, spray, fluidized bed drying, tunnel drier, drum drier (working principles with schematic diagram only) Concept of critical moisture, equilibrium moisture content Concept of evaporation and evaporation equipments Concept osmotic dehydration, IMF food.

Unit - 3

06

Refrigeration and Freeze Drying: Types of refrigerant & use Types of freezer – plate, blast, vacuum, immersion, cryogenic freezing (principles, schematic diagram & use only) Working principles of refrigerated van, wagon and cold storage and their use, Different phases of freeze drying, Time-temperature relation Quality aspect of freeze dried food product,

Unit - 4

06

Preservation by Fermentation: Introduction to fermentation (general view) Different fermented food (name, source & use) Factors affecting fermentation, Curing and pickling, Hurdle technology.

Unit - 5

06

Irradiation: Principles, measurement unit, Effect of irradiation on food product Different food product
Use of preservative in foods: Chemical preservative, bio-preservative
CA Storage and MAP: Basic principle of CA, MA storage of fruits and vegetables

References:

1. Food Process Engineering / D.R. Heldman & R.P. Singh / AVI.
2. Food Processing and Preservation / G. Subbulakshmi & S.A. Uddipi / New Age International.
3. Elements of Food Engineering / J.C. Harper / AVI.
4. The Technology of Food preservation / N.W Desrosier / AVI.
5. Food Science & Technology / Magnus Pyke / John Murray, London.
6. Food Science / B. Srilaxmi / New Age International.
7. Foods Facts and Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New age International.
8. Fundamentals of Food Processing Operations / J.L. Heid & M.A Joslyn / AVI.

BVFPT403

FOOD TOXICOLOGY AND ALLERGY

Course Outcomes:

- Study the basics of food toxicology
- Discuss about food allergy and sensitivity
- Explain the principles of toxicology
- Describe the toxicant in food samples
- Illustrate the toxicants formation during food processing

Unit - 1

06

Introduction: Definition and need for understanding food toxicology; Hazards - Microbiological, nutritional and environmental. Basics of immune resources - humoral and cell media resources. Allergen and mechanism of allergic resources.

Unit - 2

06

Food allergy and sensitivity: Chemistry of food allergens, celiac disease, food disorders associated with metabolism, lactose intolerance, and asthma.

Unit - 3

06

Principles of toxicology: Natural food toxicants - toxicity of mushroom alkaloids, seafood, vegetables, fruits, pulses, and antinutritional compounds.

Biological factors that influence toxicity, toxin absorption in the G.I. track, Industrial microflora, blood, brain barrier, storage and excretion of toxins

Unit - 4

06

Determination of toxicants in food sampling: Quantitative and qualitative analysis of toxicants in foods; Biological determination of toxicants.

Assessment of food safety– Risk assessment and risk benefit indices of human exposure, acutetoxicity, mutagen city and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioral effect, immunotoxicity.

Unit - 5

06

Toxicants formed during food processing: Intentional direct additives, preservatives, nitrate, nitrite, and N-nitroso compound flavor enhancers, food colours, indirect additives, residues and contaminants, heavy metals, other organic residues and packaging materials.

Toxicity of heated and processed foods, food carcinogens and mutagens - Polycyclic aromatic hydrocarbons, N - nitrosamines, Acrylamide and their mode of action

References:

1. Helferich, William and Carl K.Winter “Food Toxicology”, CRC Press, 2001.
2. Alluwalia, Vikas “Food Hygiene and Toxicology” Paragon International Publishers, 2007
3. Shibamoto, Taka yuki and Leonard F.Bjeldanzes “Introduction to Food Toxicology” IIEdition. Academic Press, 2009.
4. Maleki, Soheila J. A.Wesley Burks, and RickiM.Helm “Food Allergy” ASM Press, 2006.
5. Labbe, Ronald G. and Santos Garcia “Guide to Food Borne Pathogens” John Wiley & Sons, 2001.

BVFPT404

TECHNOLOGY OF FOOD-II

Course Outcomes:

- Understand the basics of fish
- Describe the fundamentals of meat
- Acquire the knowledge of poultry and eggs
- Discuss the fundamentals of fruits and vegetables storage
- Illustrate the details of dairy products

Unit - 1

06

Fish: Classification of fresh water fish and marine fish; Fish as raw material for processing and its biochemical composition. Factors affecting the quality of product. Physical, chemical, microbiological and sensory changes during storage, Commercial storage and transport of raw fish, Proximate composition of fish, Different spoilage & quality assessment Preservation of fish by canning, freezing & drying; salting, Smoking & curing of fish, Manufacture of fish protein concentrates, fish oil, fish paste & fish sauce, fish oil, fish meal, IQF prawn, fermented fish product and other important byproducts; Quality control of processed fish.

Unit - 2

06

Meat: Chemical and nutritional composition of meat; The quality of meat - color, water holding capacity (WHC) and juiciness, texture and tenderness, odour and taste, Postmortem changes of meat. Meat processing- comminution, emulsification, curing, smoking, cooking, ageing and tenderization; Meat products - meat emulsion, fermented meats, sausages, ham, bacon and comminuted meat products; Meat analogs; Meat storage and preservation- by temperature control (refrigeration, freezing, thermal processing), by moisture control (dehydration, freeze drying, curing, IMF meat), by microbial inhibition (chemical preservation, ionizing radiation); Packaging of meat products. Meat production, processing and consumption trends; Meat plant sanitation and waste disposal; By-products from meat industries and their utilization.

Unit - 3

06

Poultry: Classification of poultry meat; Composition and nutritional value of poultry meat; Processing and preservation of poultry meat, spoilage and control; By-product utilization.

Egg and egg products: Structure, composition and functions of eggs; Abnormalities in eggs; Functions of eggs in food products; Inspection and grading for egg quality; Preservation and safe handling of eggs; egg quality assessment, Spoilage and control; Coagulation of eggs, egg foams, egg powder and egg based products.

Unit - 4

06

Fruits and Vegetables: Types of fruits and vegetable, chemical composition, physical & chemical treatment for increasing post-harvest shelf life, storage & handling – CA, MA storage, Cold storage, Different microbial groups associated with fruits & vegetables, microbial change during storage, Effects of enzymes on quality of fruit & vegetable storage, methods for preventing microbial attack on fruit & vegetable during harvesting & storage. Preparation of jam, jelly, machineries used in fruits and vegetables processing, Analysis and quality control of Fruits and Vegetables Products , Analysis and quality control of fruit juice beverage products.

Non-alcoholic Beverage: Proximate composition of tea, coffee & cocoa; different grades of tea and coffee; tea & coffee processing, different tea & coffee products, preparation of health drinks. Analysis and quality control of tea, coffee & cocoa products.

Unit - 5

06

Dairy Product: Chemical composition of milk, effect of heat on milk constituents, milk fat detection by Garber test, refractive index of milk, milk adulteration, Pasteurisation & homogenisation of milk, Microbiology of milk- detection of Ecoli in milk, microbes present in milk, inhibitors in milk., Drying of milk – drum, spray drying, Toned, skim, synthetic, dehydrated milk, Production of butter, ghee, cheese and ice cream (only flow process and brief discussion)

References:

1. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International
2. Food Science / N.N. Potter
3. Food Science / B. Srilaxmi / New Age international
4. Meat processing and preservation with packaging Technology, NIIR Board, Asia pacific Business press.
5. Processing of fruits & vegetables/Giridharilal & Siddappa
6. Technology of Food Preservation/ Desrosier & Desrosier
7. Principles of Food Science / Karek & L.M. Delker
8. Food Analysis / R. Lees / C.R.C Press Ltd.

BVFPT405P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-05

BVFPT501

MILK AND MILK PRODUCTS PROCESSING

Course Objectives:

- To understand techniques in Milk and Milk Product processing
- To give the students knowledge of study the working of equipments used in Milk and Milk Product Processing

Course Outcomes:

- Students will have knowledge of the fermented milk products.
- Students will gain the knowledge about techniques in the milk and milk products

Unit - 1

08

Introduction to Milk and milk products: Definition, Production and Processing status of milk, Physio-chemical properties, Composition and Nutritive value.

Unit - 2

08

Processing and preservation of Milk Pasteurisation, Dehydration, Sterilization.

Unit - 3

07

Special Milks: Condensed milk, Toned milk and Flavoured milk, Re-constituted or Re-hydrated milk, UHT Milk

Unit - 4

07

Milk Products: Dahi, Chakka, Shrikhand, Butter, Butter Milk, Butter Oil, Lassi, Channa, Paneer, Rasogolla, Khoa and Basundi Icecream and Cheese, Preservation of Milk and Milk Products.

References:

1. Dey S., 1994, Outlines of Dairy Technology, Oxford Univ. Press, New Delhi.
2. Rosenthal., 1991, Milk and Milk Products, VCH, New York.
3. Robinson R.K., (2vol.set), 1986, Modern Dairy Technology, Elsevier Applied Science, UK.
4. Warnar J.M., 1976, Principles of Dairy Processing, Wiley Eastern Ltd, New Delhi
5. "Manual of Industrial Microbiology and Biotechnology", by Demain, AL and NA Solomon, 1986, American Soc. for Microbiology, Washington, D.C.
6. "Microbiology of fermented foods", edited by Wood, B.J.B., 1998, Vol.1 and Vol. 2, Blackie Academic and Professional, London.

BVFPT502

PROCESSING AND PRESERVATION OF AGRO BASED FOODS

Course Objectives:

- To understand the processing techniques of agro products.
- To know the use of agro processing equipments.

Course Outcome:

Students will gain the knowledge of processing techniques of agro products

Unit - 1

08

Agro processing industry:

- Introduction to Agro processing industry.
- Scope and importance of Agro processed products.
- Processing equipments – Floor mill, mini grain mill pulverizers, Hammer mill, Floor separator, Dal mill, Packing and Sealing machine, Balance.

Unit - 2

08

Cereal grain Processing:

- Different grains suitable for agro processing,
- Primary, secondary and conventional processing of major cereals, Milling of cereals- Dry and Wet milling.

Unit - 3

07

Pulses and Legumes processing

- Principles of pulse milling, Different methods of Dhal milling, Milling of major legumes, Thermal treatment.

Unit - 4

07

Oil seeds Processing:

- Properties and suitability of oil seeds for processing,
- Methods of oil seed processing,
- Terminologies in oil processing industry,
- Preservation of Agro based foods .

References:

1. Kader A A: Postharvest technology of horticultural crops.2nd edition, University of California
2. Salunkhe D K and Kadam S S: hand book of world food legumes, CRC Press, Florida
3. Niir Board: Modern Technology of Agro processing and Agricultural waste, National Institute of India Re 2000.
4. Salunkhe DK, Chavan JK, Adsule R N and Kadam S S: World oil seeds chemistry, technology and utilization. VNR, New York

BVFPT503

FOOD EXTRUSION TECHNOLOGY

Course Outcomes:

- Understand the basics of extrusion process
- Describe the types of screw extruder
- Illustrate the processing of breakfast cereal and spaghetti
- Discuss the details of texturized vegetable protein
- Explain the fundamentals of extruded foods

Unit - 1

06

Extrusion: Definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, net flow, factors affecting extrusion process.

Unit - 2

06

Twin screw extruder: Counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder Pre-conditioning of raw materials used in extrusion process Use of dry extruders in extrusion Chemical and nutritional changes in food during extrusion.

Unit - 3

06

Classification of Breakfast cereals: Raw materials, Preparation of noodles/ vermicelli process and quality testing of vermicelli,

Spaghetti: Raw materials, process and quality testing of pasta and macaroni products.

Unit - 4

06

Texturized vegetable protein: Definition, processing techniques, and foods Ready to eat breakfast cereals by extrusion cooking. Cooking quality of TVP

Unit - 5

06

Extruded Foods: Physical properties of extruded foods (expansion, density, water absorption index, etc), Preparation of weaning foods, Determination of oil absorption capacity of extruded products, Determination of water absorption capacity of noodles, Studies on Textural Profile Analysis of extruded products, Effect of extrusion cooking on ant nutritional factor .

References:

1. Extruders in Food Application, Riaz M.N. CRC Press, 2000
2. Advances in Food Extrusion Technology, Maskan and Altan, CRC press 2000
3. Extrusions of Foods, Harper JM, CRC Press, 1981
4. Food process Engineering and Technology, Berk Z, Academic Press, 2013

BVFPT504

FOOD PACKAGING TECHNOLOGY

Course Outcomes:

- Study the fundamentals of food packaging
- Describe the basics of packaging materials and properties
- Acquire the knowledge of packaging materials and properties
- Illustrate the details of packaging machineries and evaluation
- Explain packaging systems and regulations

Unit - 1

06

Introduction: Introduction to Food Packaging: Definitions, types of packaging materials, manufacturing processes, Importance and scope functions of packaging, Factors responsible for the selection of Packaging materials for fresh and processed food products.

Unit - 2

06

Packaging Materials and Properties: Types, properties, advantages and disadvantages –Primary Packaging Materials (Paper and paper based packaging materials, Plastic as packaging materials). Secondary Packaging Material (Folding carton) Transport packaging materials Ancillary Packaging Materials (Printing inks, varnishes, lacquers and adhesives), Glass packaging materials, Composition, structure, properties, Aluminium foil, Metal packaging materials.

Unit - 3

06

Packaging Requirements: Packaging requirements of different types of foods: fruits and vegetables, meat, fish, poultry, dairy products, edible oils and spice products, bakery products, confectioneries, Instant foods, extruded foods, snack foods, alcoholic and non-alcoholic, carbonated beverages.

Unit - 4

06

Machineries & Evaluation: Packaging Machineries: Bottling, canning, capping, labeling, form- fill sealing, strapping, cartooning machineries. Package Evaluation: evaluation of mechanical, optical and barrier properties like WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test.

Unit - 5

06

Packaging Systems and Regulations: Packaging Systems-Vacuum and gas packaging, aseptic packaging, retort packaging, CAP and MAP, intelligent packaging, active packaging, shrink packaging, lined cartooning system, PET, TTI, Preform, tetra pack processes. Bio-composite and alternative packaging.

Packaging standards and regulations-laws, specifications and quality control, collection, separation, disposal and recycling of packaging materials

References:

1. Food Packaging Materials, N.T.Crosby, published by Applied Science.
2. Plastic Films for Packaging Technology, Calvin J. Bening, published by Technomic.
3. Packaging of Food Beverages- F.T.Day.
4. Food Packaging- Sacharow & Griffin.
5. Flexible Packaging of Foods- A.L. Brody

BVFPT505P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-06

BVFPT601

EMERGING TECHNOLOGIES IN FOOD PROCESSING

Course Outcomes:

- Understand the basics of high pressure processing foods
- Explain pulsed electric field processing
- Describe the fundamentals novel method.
- Discuss the basics of hurdle technology
- Illustrate the details of innovation in food refrigeration

Unit - 1

06

High pressure processing foods: Introduction, principles, use of high pressure to improve food safety and stability, Effects of high pressure on food quality, Applications of high pressure. HPP of Salads/ Ready Meals – effects on microorganisms, enzyme activity, texture and nutrients.

Unit - 2

06

Pulsed electric field processing: Mechanism of action, PEF treatment systems, PEF processing of liquid foods and beverages. High intensity electric field pulses on solid foods. Non thermal methods- its applications - Application of light pulses in sterilization of foods and packaging materials.

Unit - 3

06

Novel Method: Non thermal processing by radio frequency electric fields; Ultrasound as a food preservation tool; Freeze drying - Food irradiation - advantages and applications. – Super critical fluid extraction Aseptic processing in foods - extrusion cooking – equipment

Unit - 4

06

Hurdle Technology: Basics of hurdle technology – Mechanism, Application to foods - Newer Chemical and Biochemical hurdles- organic acids – Plant derived antimicrobials – Antimicrobial enzymes– bacteriocins chitin/chitosan (only one representative example for each group of chemical and biochemical hurdle).

Unit - 5

06

Innovation in Food Refrigeration: Vacuum cooling of foods, High pressure freezing, Freeze drying (lyophilisation) – Theory , Equipment, Effect on foods, Freeze concentration – Theory, Equipment

References:

1. Da-Wen Sun, "Emerging Technologies for Food Processing", Academic press/ Elsevier, London, UK, 2005.
2. Leistner L. and Gould G. Hurdle Technologies – Combination treatments for food stability. safety and quality, Kluwer Academics / Plenum Publishers, New York (2002).
4. Da –Wen Sun, "Thermal Food Processing: New Technologies and Quality Issues, 2nd Edition, CRC Press/Taylor & Francis, Boca Raton, Florida, USA, 2012.
5. Gustavo V.Barbosa-Canovas, Maria S.Tapia and M.Pilar Cano, " Novel Food Processing Technologies". CRC Press, 2004.

BVFPT602

FOOD ADDITIVES AND PRESERVATIVES

Course Outcomes:

- Study the details of food additives
- Understand the role of food acidulants and pigments
- Illustrate the basics of food preservatives and antioxidants
- Acquire the knowledge of stabilizer and sweeteners
- Explain the fundamentals of flavoring agents and starch modifiers

Unit - 1

06

Toxicology and Safety Evaluation of Food Additives, Effects of Food Additives, Food Additives generally recognized as safe (GRAS), Tolerance levels & Toxic levels in Foods, Legal safeguard, Risks of food additives.

Unit - 2

06

Naturally occurring food additives: Classification, Health Implications, and Role in Foods.

Acidulants: Introduction, Different acidulants, Role in food processing.

Food colorants: Introduction, Natural & Synthetic food colorants, Classification of Food colorants, Chemical nature, Impact on health.

Pigments: Importance, Classification, Utilization as food colour.

Unit - 3

06

Food Preservatives: Introduction; Classification- Natural & chemical preservatives; Mode of action; Role in Food processing.

Antioxidants & chelating agents: Introduction, Role in foods, Types of antioxidants -natural & synthetic, Mode of action of antioxidants in foods; chelating agents- Naturally & synthetic; Mode of action of chelating agents; Applications of antioxidants and chelating agents.

Unit - 4

06

Stabilizers, thickeners and Emulsifiers: Introduction, Types, Applications in food processing; Sweeteners: Introduction; Classification-Artificial sweeteners & Non-nutritive sweeteners, Health implications, Role in food processing.

Unit - 5

06

Taste and Flavoring agents: Introduction, Classification of flavors- natural & synthetic, Flavor enhancer/Potentiation, Importance of taste and flavours, Role of flavoring agents in food processing.

Anti-caking agents and Humectants: Introduction, Different Anti-caking agents and Humectants, Role in food processing

Starch modifiers: Introduction, Chemical nature, Role in food processing, Antimicrobial agents, Clarifying agents, antifoaming agents, Fat mimetics and replacers: Introductions; Role in food processing;

References:

1. Food Additives: A Larry Branen, P Michael Davidson and Seppo Salminen, CRC Book Press. USA.
2. Food Additives: S.N. Mahindru, APH Publishing Corporation, Drya Ganj, New Delhi.
3. Food chemistry:,Owen R Fennema, Marcel Dekker, Inc. New York. 1996
4. Food chemistry: Lillian Hogland Meyer, Avi Pub Co .1974

BVFPT603

FOOD SAFETY AND QUALITY CONTROL

Course Outcomes:

- Study the basics of food safety
- Describe foods analysis and quality evaluation
- Acquire the knowledge statistical of quality control
- Discuss the fundamentals of food legislation and standard
- Illustrate the details of quality standards

Unit - 1

06

Introduction to Food Safety: Definition, food safety issues and strategies [concept of food safety and standards (FSSAI)], factors affecting food safety, importance of safe foods, factors affecting shelf life and methods to check the shelf life. Food hazards and contaminations - biological (bacteria, fungus and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical factors. Prevention and control of microbiological and chemical hazards. Recent concerns on food safety: Genetically Modified Foods.

Unit - 2

06

Food Analysis & Quality Evaluation: Food Analysis: Objective and purpose of food analysis; food adulteration; Simple and quick method of adulteration detection. **Sensory Evaluation:** Definition, objectives, panel selection, sensory techniques, pros & cons, Sensory evaluation of food by subjective method- Difference tests, Sensitivity test, Rating test, Objective method- colour (Theory of spectrophotometer & colorimeter, selection of filter, Colour measurement, Colour specification), Brooke field Viscometer (Principle), Rheological properties of fruitjuice and concentrate, Different textural attributes of food, Texture measurement instruments and unit of measurement, Instron testing machine), Chromatographic principle (HPLC), Atomic absorption spectrophotometer principle for measurement of heavy metals

Unit - 3

06

Statistical Quality Control: Basic concepts, uses, limitations, applications of statistics in food quality control. Types of data, data collection methods. Data presentation, Graphical presentation of data (histogram, bar diagrams, line diagram, frequency polygon), Measures of central tendency (Mean, Median, Mode.), Measures of dispersion (range, quartile deviation, mean absolute deviation, standard deviation, coefficient of variation), Measures of skewness & Kurtosis. Control Charts. Sampling (Definition of sampling, purpose, sampling techniques, requirements and sampling procedures). Hypothesis testing. Applications of t-test, z-test, F-test, Chi square test.

Unit - 4

06

Food Legislations & Standards: National Food Legislations: PFA, FPO, MPO, BIS, AGMARK, ISI, Misbranding, Enforcement, Essential Commodities Act, 1954; Consumer Protection Act, 1986. International Food Legislations: FAO, WHO Codex Alimentarius, Codex India, JECFA (Joint FAO/WHO Expert Committee on Food Additives), WTO, SPS (Sanitary and Phytosanitary Measures), TBT (Technical Barriers to Trade), ISO (International Organization for standard)

Unit - 5

06

Quality Standards: GMP, GHP, HACCP, GAP, ISO Series (9000, 22000, 14000 & 17025.)

References:

1. Food Quality Assurance: Principles and Practices, Inteaz Alli, CRC Press, 2003
2. Quality Assurance for the Food Industry: A Practical Approach, J. Andres Vasconcellos, CRC Press, 29-Dec 2003

BVFPT604

FOOD INDUSTRIES WASTE MANAGEMENT

Course Outcomes:

- Study the details of waste treatment of parameters and stream pollution
- Describe the basics of waste treatment.
- Illustrate the details of waste treatment units.
- Acquire the knowledge of industrial waste treatment
- Discuss the source and characteristics of solid waste treatments

Unit - 1

06

Waste Treatment Parameters: Constituents of suspended solids, volatile suspended solids, MLVSS, BOD, COD, Dissolve oxygen, Analytical determination of BOD, COD and DO, Mathematical model for BOD, BOD curve.

Stream Pollution & Measurement: Nature of stream pollution, Oxygen sag curve, Oxygen sag equation and industrial problems based on oxygen sag equation.

Unit - 2

06

Fundamental of physical and chemical treatment: Objective of physical treatments, screening, flow equalization, mixing and flocculation, gravity separation, grit removal, sedimentation, Ideal sedimentation tank concept, high-rate clarification, flotation, aeration system (principle only). Objective of chemical treatments, chemical coagulation, chemical precipitation, chemical oxidation, neutralization and stabilization (Principle only).

Fundamentals of biological treatment: Objective of biological treatment, Types of biological process, Microbial growth kinetics, Substrate utilization kinetics, Aerobic biological oxidation, Biological nitrification and denitrification, Biological phosphorous removal, Anaerobic biological oxidation, Biological removal of toxic, recalcitrant organic compound and heavy metals (No design principle only)

Unit - 3

06

Biological Treatment unit: Activated sludge process and advantage (No design), Rotating biological contractors and its advantage and disadvantage (No design), Aerated lagoon – principle, application, advantage, residence time in aerated lagoon, brief discussion on stabilization pond(no problem) Trickling filter (only principle, application, advantage) Facultative pond, Oxidation ditch, aerobic pond, Biofilters and Bioclarifiers Anaerobic suspended and attached growth biological treatment process- Anaerobic contact process, anaerobic sludge blanket process, attached growth anaerobic process, (principle, application,)

Unit - 4

06

Industrial Waste Treatment: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment, reuse and recycling. (Only principle, application,)

Unit - 5

06

Solid Waste Treatment: Source and characteristics of solid wastes, Preliminary operation, thickening, stabilization, anaerobic digestion, aerobic digestion, composting, Vermicomposting conditioning, dewatering, heat drying, incineration, disposal and landfilling. (only principle, application,)

References:

1. Waste treatment engineering / H.J. Hammer
2. Waste treatment / Eddy & Metcalf .
3. Environmental Science / J. Turk & A. Turk
4. Environmental Pollution / Dix Pollution Control Acts, Rules and Notification / Central
5. Pollution Control Board, New Delhi
6. Wastewater engineering- Jain and Jain

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