UNIT-

THE GANDHIGRAM RURAL INSTITUTE- DEEMED TO BE UNIVERSITY
GANDHIGRAM
DEPARTMENT OF HOME SCIENCE
Scheme of syllabus for DDU- KK UGC approved B.Voc. Food Testing and Quality Evaluation Degree Programme

Semester I (NSQF Level 4)

Category	Course Code	Title of the Course	Credit	Contact Hours/ Week			Marks Distribution		
				Theory	Practical	Total	CFA	ESE	Total
General Components	**18ENGU01G2**	General English I	3+1	3	1	4	40	60	100
	15YOGU0101	Yoga	0+1	-	1	1	50	-	50
	18FTQV0101	Laboratory Operation and Maintenance I	3+1	3	1	4	40	60	100
	TOTAL		**09**	**06**	**03**	**09**	**130**	**120**	**250**
Skill Components	**18FTQV0102**	Food Chemistry	3+0	3	-	3	40	60	100
	18FTQV0103	Laboratory Techniques	3+0	3	-	3	40	60	100
	18FTQV0104	Food Science I	3+0	3	-	3	40	60	100
	18FTQV0105	**Practical I-** Laboratory Techniques	0+4	-	4	4	60	40	100
	18FTQV0106	**Practical II-** Food Science- I	0+4	-	4	4	60	40	100
On Job Training (OJT)*	**18FTQV0107**	**Food lab worker Internship at Food Standards and Regulations/ Food Lab Equipment and its Handling**	0+4	-	4	4	50	-	50
	TOTAL		**21**	**09**	**12**	**21**	**290**	**260**	**550**
	GRAND TOTAL		**30**	**15**	**15**	**30**	**320**	**380**	**800**

UNIT-

Semester II (NSQF Level 5)

Category	Course Code	Title of the Course	Credits	Contact Hours/ Week			Marks Distribution		
				Theory	Practical	Total	CFA	ESE	Total
General Components	**18FTQV0208**	Environmental Science	3+1	3	1	4	40	60	100
	18CSAU02A1	Computer Fundamentals and Office Automation	3+1	3	1	4	60	40	100
	18FTQV0209	Laboratory Operation and Maintenance II	3+1	3	1	4	40	60	100
	TOTAL		**12**	**09**	**03**	**12**	**190**	**160**	**350**
Skill Components	**18FTQV0210**	Food Microbiology	2+1	2	1	3	40	60	100
	18FTQV0211	Food Adulteration	2+0	2	-	2	50	-	50
	18FTQV0212	Food Science II	2+0	2	-	2	50	-	50
	18FTQV0213	**Practical III-** Food Adulteration	0+4	-	4	4	60	40	100
	18FTQV0214	**Practical IV-** Food Science- II	0+4	-	4	4	60	40	100
On Job Training (OJT)*	**18FTQV0215**	**Food Lab Asst Training in FSSAI/ Quality Analysis for Foods**	0+3	-	3	3	50	-	50
	TOTAL		**18**	**06**	**12**	**18**	**310**	**140**	**350**
	GRAND TOTAL		**30**	**15**	**15**	**30**	**500**	**300**	**700**

Semester III

UNIT-

Category	Course Code	Title of the Course	Credit	CFA	ESE	Total
General Components	**18FTQV0316**	General English II	3	40	60	100
	18FTQV0317	Instrumental Methods for Food Analysis	3	40	60	100
	18FTQV0318	Principles of Food Preservation	2	50	-	50
	18FTQV0319	**Practical V-** Principles of Food Preservation	4	60	40	100
	TOTAL		**12**	**190**	**160**	**350**
Skill Components	**18FTQV0320**	Food Safety	3	40	60	100
	18FTQV0321	Food Analysis	2	50	-	50
	18FTQV0322	Food Safety System in Dairy Industry	3	40	60	100
	18FTQV0323	**Practical VI**- Food Analysis	4	60	40	100
	18FTQV0324	**Practical VII**- Quality Evaluation of Milk and Milk Products	4	60	40	100
On Job Training (OJT)*	**18FTQV0325**	**OJT**	2	50	-	50
	TOTAL		**18**	**300**	**200**	**500**
	GRAND TOTAL		**30**	**490**	**360**	**850**

#appropriate window may be provided for OJT in food industries

UNIT-

Semester IV

Category	Course Code	Title of the Course	Credit	CFA	ESE	Total
General Components	**18CSAU03A2**	Internet and Web Designing	4	40	60	100
	15GTPU0001	Gandhi's Life, Thought, Work	2	50	-	50
	18FTQV0426	Food Packaging	3	40	60	100
	18FTQV0427	Food Quality Assurance	3	40	60	100
	TOTAL		**12**	**170**	**180**	**350**
Skill Components	**18FTQV0428**	Bakery and Confectionary	3	40	60	100
	18FTQV0429	Quality Evaluation of Food Grains and its Products	4	40	60	100
	18FTQV0430	**Practical VIII**- Quality Evaluation of Food Grains and its Products	4	60	40	100
	18FTQV0431	**Practical IX**- Quality Evaluation of Bakery and Confectionery Products	4	60	40	100
On Job Training (OJT)*	**18FTQV0432**	**OJT**	3	100	-	100
	TOTAL		**18**	**300**	**200**	**500**
	GRAND TOTAL		**30**	**470**	**380**	**850**

#appropriate window may be provided for OJT in food industries (NSQF LEVEL 6)/FOOD QUALITY CONTROLLER

UNIT-

Semester V

Category	Course Code	Title of the Course	Credit	Marks Distribution		
				CFA	ESE	Total
General Components	**18FTQV0533**	Accounting and Book Keeping	4	40	60	100
	18FTQV0534	Food Hygiene	3	40	60	100
	18FTQV0535	Sensory Evaluation	3	40	60	100
	TOTAL		**10**	**120**	**180**	**300**
	18FTQV0536	Processing of Beverages and Spices	3	40	60	100
	18FTQV0537	Processing of Fruits and Vegetables	3	40	60	100
	18FTQV0538	**Practical X**- Quality Analysis of Beverages and Spices	4	60	40	100
	18FTQV0539	**Practical XI**- Quality Analysis of Fruits and Vegetables	4	60	40	100
		ELECTIVE	3	40	60	100
On Job Training (OJT)*	**18FTQV0540**	**OJT**	3	100	-	100
	TOTAL		**20**	**340**	**260**	**600**
	GRAND TOTAL		**30**	**460**	**440**	**900**

#appropriate window may be provided for OJT in food industries

UNIT-

Semester VI

Category	Course Code	Title of the Course	Credit	Marks Distribution		
				CFA	ESE	Total
General Components	**18FTQV0641**	Design and Development of Food Testing Lab	4	40	60	100
	18FTQV0642	FSSAI Regulation on Food Testing	4	40	60	100
	18FTQV0643	Food Laws and Legislations	4	40	60	100
Skill Development	**TOTAL**		**12**	**120**	**180**	**300**
	18FTQV0644	**Practical XII**- SOP Development	2	50	-	50
	18FTQV0645	**Project Work**	14	100	100 (75+25)	200
	18FTQV0646	**Internship**	2	50	-	50
		TOTAL	**18**	**200**	**100**	**300**
		GRAND TOTAL	**30**	**320**	**280**	**600**

#appropriate window may be provided for OJT in food industries (NSQF Level 7)/FOOD ANALYST

UNIT-

First Semester

General English I

Code: 18FTQE0101 Credit: 4 Contact Hours/Week: 4 Marks:100

Objectives:

- To improve the English language skills of the students
- To focus on the language skills of the learners in a graded manner.

Unit I Grammar

- What is Grammar?
- The Capital Letter
- Nouns & Pronouns

Unit II Listening

- Teacher Narrations

Unit III Speaking Skills

- Self-Introduction
- Descriptions of persons, objects, places

Unit IV Reading & Vocabulary

- Graded reading comprehension passages

Unit V Writing Skills

- Sentence Construction
- Descriptive Paragraph writing

Textbook:

General English I Textbook/Course Material - Prepared by the School.

Reference Book:

Seaton, Anne & Y.H. Mew. *Basic English Grammar Book 1.* Irvine: Saddleback, 2007. Print

UNIT-

LABORATORY OPERATIONS AND MAINTENANCE- I

Code: 18FTQE0103 Credits: T2+P1 Hours/week:3 Marks: 100

OBJECTIVES

To enable students to

1) familiarize the students with laboratory organisation

2) enable the students to use the theoretical knowledge in operation and maintenance of laboratories.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- design considerations that apply to the lab and to the areas that directly support its operation.
- importance of laboratory organization

UNIT I

Understanding on organization and design of laboratories: the essential requirements of a typical laboratory, space, designs of laboratories - fixed and flexible design laboratories, main laboratory in relation to other rooms, benching, surfaces, furniture and storage services, ventilation, lighting, heating and cooling, ventilation, lighting, heating and cooling, flooring and fume cupboards.

UNIT II

Day-to-day management of the laboratories: day-to-day organization, day-to-day cleaning up, sterilization, disposal of wastes, routine inspection and maintenance of laboratory, maintenance of equipment, apparatus and furniture- prevention of dust, reduction of vibration, prevention of corrosion and rust, prevention of equipment from excessive heat; correct usage of instruction manual; servicing of equipment.

UNIT III

Cleaning of laboratories and preparation rooms; colour coding of services, emergencies with services - emergency procedures for flooding and gas leaks; security and vandalism; storing of acids, alcohols and other toxic chemicals and their care; records; stock records, recording loans, recording stock used and misused, record of use of listed poisons, record of use of alcohol, record of breakages; information about equipment serial number, maintenance record, electrical checks and miscellaneous records; accident and incident record.

UNIT IV

Files: sources of information- classifying secondary and tertiary information sources, sources of information in the lab or preparation room, Filing systems- aims of filing systems, classification of files, filing methods, filing system for equipment, filing system for

UNIT-

chemicals, filing of printed and written material work sheets/instruction for experiments- Demonstration.

UNIT V

Arranging stock, locating and referencing: shelf arrangement of stock by nomenclature, stock control- the two bin system, the constant cycle system; record keeping- bin cards, order books, inventory, service register; ordering procedure: preparation of list of requirements, inviting quotations, factors deciding purchases, role of purchase committee, purchase of alcohol, placing an order, tax and discounts; receipt of goods, taking delivery, processing of bills; accounting: records of expenditure controlling, budget, petty cash and impress money.

Related Experience

1. Study of design and features of a laboratory
2. Design and organization of laboratory store
3. Demonstration of sterilization, disposal of wastes, cleaning of equipments, using instruction manual for operating equipments
4. Demonstration of Gas Leaks, electrical checks, colour coding for services
5. Demonstration for stock records
6. Writing purchase order for chemical, alcohol etc
7. Recording of Cash transaction
8. Visit to different food testing laboratory

TEXT BOOKS

1. Rao B.V.S, (1963). Operation & Maintenance of Electrical Equipment - Volume I; Media Promoters and Pub Pvt Ltd.
2. Rao B.V.S, (1967). Operation & Maintenance of Electrical Equipment - Volume II; Media Promoters and Pub Pvt Ltd.

REFERENCE BOOKS

1. Rao S, (2010). Testing Commissioning Operation & Maintenance Of Electrical Equipments; Khanna Publishers.

2. National committee for Clinical laboratory standards. 1996. Clinical laboratory manuals, 3rd ed. approved guideline 3P2-3A.Villanova, Pa.

UNIT-

FOOD CHEMISTRY

Code: 18FTQE0104 Credits: T3 + P0 Hours/week: 3 Marks: 100

Objectives:

To enable the students to

- gain knowledge regarding the physical and chemical properties of the food constituents
- understand the chemical and physical changes that occur food during processing

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- name and describe the general chemical structure of major components of foods (water, carbohydrates, protein and lipids)
- explain how changes in overall composition are likely to change the reactivity of food components.
- predict how processing conditions are likely to change the reactivity of food components.

UNIT- I

Introduction to food chemistry, food constituents: proximate composition of foods, water in foods; water- structure of water and ice, physical constants of water, types of water, water activity.

UNIT- II

Carbohydrate: introduction, definition, classification; general properties of sugar (physical and chemical) identification of common monosaccharides- structure, disaccharides- structure and polysaccharides- structure, chemistry of starch, glycogen, cellulose, gums and crude fibre.

UNIT- III

Protein: physical and chemical properties of amino acids; classification of proteins, and amino acid, sequence in proteins, physical and chemical properties of proteins, molecular weight of proteins, protein denaturation.

UNIT- IV

Lipids: classification of lipids, structure, fatty acid, essential fatty acids, saponification number, acid numbers, iodine value, rancidity- oxidative and hydrolytic.

UNIT-V

Enzymes -introduction, meaning and importance, classification of enzyme, enzyme kinetics, enzyme activity, factors affecting enzyme activity; pigments- meaning, classification, properties; chlorophyll, carotenoids, anthocyannis, anthoxanthins, flavonoids, tannins, natural flavour constituents.

UNIT-

TEXT BOOKS

1. Potter, N.N. and Hotchkiss, J.H.(1996). Food Science, edition 5, CBS Publishers and Distributors, New Delhi.
2. Damodaran S, K.L. Parkin, and O. Fennema (Eds.), Marcel Dekker, NY,(2007). Fennema's Food Chemistry" 4th Edition.CRC press Taylor &Francis.

REFERENCE BOOKS

1. Seema Yadav, (1997). Food Chemistry, Anmol Publications Pvt.Ltd., New Delhi.

2. Meyer, (1991). Food Chemistry, AVI Publications, New York.
3. Ronsivalli,.L.J. and Vieira, E.R. (1992). Elementary Food Science, 3rdEdition, Chapman and Hall, New York.
4. H.D.Belitz,W.Grosch and P.Schieberie , (2009).Food Chemistry 4th edition ,Springer publications
5. Srinivasan Damodaran,Kirk L.Parkin and Owen R.Fennema. (2007).Food chemistry (4th edition) CRC Press.
6. John M. DeMan (1999). Principles of Food Chemistry, Springer publications.

UNIT-

LABORATORY TECHNIQUES

Code: 18FTQE0105 Credits: T2 + P0 Hours/week: 2 Marks: 100

OBJECTIVES

To enable the students to

1. understand basics of laboratory procedures
2. understand the use of various basic laboratory equipments.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- know the basics of analysis.
- Know the use of basic laboratory equipments.

UNIT I

Introduction to laboratory apparatus: introduction, identification of a apparatus, apparatus for heating: bunsen burner, air bath, water bath, oil bath, sand bath, hot plate heating, mantle heating and block immersion heater laboratory; glassware: jointed glassware, setting up demonstrations, selecting the apparatus, setting up the apparatus, laboratory centrifuge- use and description, rotor heads- advantages and disadvantages; laboratory glass: types of laboratory glass, characteristics of laboratory glass, laboratory glass components, glass rod and tubing demountable joints valves and stopcocks, possible hazards from glass dangers -cut glass, heating glass; protective clothing, respiratory hazards and first aid in glass working.

UNIT II

Measurement and measuring devices: introduction, mass and weight, balances: double-pan, analytical balance, single– pan, mechanical analytical balance, single-pan electronic analytical balance, digital balance, types of volume, measuring devices, approximate devices, accurate devices - burettes, pipettes and volumetric flasks; pH and conductivity: concept.

UNIT III

Solutions: introduction, water: chemical nature of water, water as a Solvent, types of water, water as a material for experiment; solutions, components of a solution, types of solution, solubility, concentration of solutions, percentage of molarity, molality and normality.

UNIT IV

Preparation of solutions: calculation of masses and volumes to prepare solutions- solids and liquids, more concentrated solutions, accuracy and precision of measurements of solutes; general guidelines for preparation of solutions; methods of preparing solutions, general methods of preparation, labelling, exceptions to the general method, notes on other solutions, bench reagents and standard solutions. Demonstration of preparative techniques- heating and agitation: heating, apparatus with interchangeable ground glass joints (Quickfit), refluxing, controlled addition of a reagent, reflux heating with controlled addition, reflux heating with controlled addition and stirring.

UNIT-

UNIT V

Organizational norms and standards followed in work place; care and maintenance of glassware: cleaning methods, selecting the best cleaning method, handling glass apparatus assembly of glass apparatus, glass tubes in bungs, suck-back gas pressure in glass, storage of glassware, storage of glass apparatus, glassware breakage records.

TEXT BOOKS

1. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. 2003. A Manual of Laboratory Techniques. National Institute of Nutrition, ICMR, Hyderabad.
2. Maintenance Manual for laboratory Manual, 2008 ,2nd Edition, WHO

REFERENCE BOOKS

1. Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. Tata McGraw Hill, New Delhi

2. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products. VCH Boundless. “Acid-Base Properties of Water.” Boundless Chemistry.

3.https://www.boundless.com/chemistry/textbooks/boundless-chemistry-textbook/acids-and-bases-15/acids-and-bases-107/acid-base-properties-of-water-451-10533/http://www.chem.uiuc.edu/clcwebsite/elec.html

UNIT-

FOOD SCIENCE I

Code: 18FTQE0106 Credits: T2 + P0 Hours/week: 2 Marks: 100

Objectives:

To enable the students to

1. describe the importance of various foods and their nutritive value and place in daily diet
2. study the effects of processing conditions on nutritive value of the foods

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- explain the basic concepts of cooking - and processing- methods applied to various types of food
- describe the science behind the processing and preparation of food products
- find out the importance and role of each ingredients in food products

UNIT- I

Introduction to food science; basic four food group; food pyramid; balanced diet; cooking- objective of cooking and methods of cooking

UNIT- II

Cereals: wheat- structure and composition; rice- composition of rice; gelatinization of starch, parboiling of rice- advantages and disadvantages; post harvest processing, quality characteristics of cereals: intrinsic and induced qualities of starch and protein; a brief description of foods from cereals-whole grain, milled, beverages, baked products and miscellaneous.

UNIT- III

Pulses: composition of pulses, processing of pulses- soaking, germination, decortications, cooking and fermentation; toxic constituents in pulses; quality characteristics of pulses; physical and functional qualities.

UNIT- IV

Fats and Oils: classification of fats and oils, sources, composition, oilseed processing-methods quality characteristics of fats and oils - physical and chemical properties.

UNIT- V

Vegetables and Fruits: classification of vegetables and fruits, browning- enzymatic and non-enzymatic browning, pigments in vegetables and fruits; post harvest changes in fruits and vegetables– climacteric and non climacteric fruits, physical and chemical changes during the storage of fruits and vegetables; quality characteristics of vegetables and fruits: physical, chemical, microbiological and nutritional qualities.

UNIT-

TEXT BOOKS

1. Srilakshmi, B. (2008). Food Science. New Delhi: Chennai: New Age International Private Limited. Publishers.

2. Swaminathan, M. (1988). Food Science and Experimental Foods. Madras: Ganesh and Company.

REFERENCE BOOKS

1. Mudambi, R.S. and Rajagopal, M.Y. (1991). Fundamentals of Food and Nutrition. Newdelhi: Wiley Eastern Limited.
2. Mudambi, R.S. and Rao. S (1987). Food Science. New Delhi: Wiley Eastern Limited.
3. Potter, N.M. and Birch, G.G. (1986). Food Science, AVI, West Port, Conn.
4. Bennion, *et al.*, (1985). Introductory Foods. New York: Macmillan.
5. **FAO , AGRICULTURAL SERVICES BULLETIN No. 109 (1994) on Grain storage techniques** Evolution and trends in developing countries.
6. Yeshajahn Pomeranz, Clifton E. Meloan. Chapman and Hall. 1994.Food Analysis, Theory and Practice, 3rd. Edition;

PRACTICAL I- LABORATORY TECHNIQUES

UNIT-

Code: 18FTQE0107 Credits: T0 + P4 Hours/week: 4 Marks: 100

1. Identification and understanding the use of various apparatus and glassware
2. Weighing of chemical using different types of balance
3. Measurement of colour and colourless solution using burette, pipette, volumetric flask
4. Measurement of pH
5. Preparation of solution by using various normality
6. Preparation of solution by using various molarity
7. Preparation of solution by using various molality
8. Preparation of standard volumetric solution
9. Preparation of solution by using different pH solution
10. Preparation of different buffer solution
11. Demonstration of glassware cleaning methods
12. Assembling and disassembling of glass apparatus
13. Sample of record for glassware breakage
14. Visit to food testing laboratory functioning inside the food industries

UNIT-

PRACTICAL II- FOOD SCIENCE I

Code: 18FTQE0108 Credits: T0 + P4 Hours/week: 4 Marks: 100

1. Display of basic four food groups

2. Cooking foods using different methods

3. Effect of cooking on cereal starch and protein,

4. Study of intrinsic quality of cereals,

5. Induced characteristics- colour, bulk density, odour, size, moisture, infested grain, broken grains and fall in number- comparison with international standards and

6. Study the gelatinization temperature and factors affecting gelatinization

7. Study on germination of pulse;

8. Study on fermentation of cereals and pulses

9. Study on intrinsic quality pulses

10. Induced characteristics- colour, bulk density, odour, size, moisture, infested grain, broken grains and fall in number- comparison with international standards

11. Study the physio chemical characteristics of oils and fats and spoilage of fat

12. Study on enzymatic and non enzymatic browning

13. Study on physical and chemical changes during storage of fruits;

14. Study on effect of cooking acid and alkali on pigments

15. Study on maturity index of fruits and vegetables- colour, flavor, texture, pH, moisture and pigments

16. Visit to cereals, pulses and oil seed processing industries

UNIT-

On Job Training (OJT)

Credit: 4 **Total Contact Hours:** **Marks:50**

Lab Technician (FIC/Q7601)

Internship at Food Standards and regulations/Food Lab Equipment and its Handling

Students have to undergo training in a Food testing lab of any private or government organization for 45 days (8 hrs/day) and gain the following key competencies

- Assist the quality controller
- Organize glassware for testing
- Organize chemicals for testing
- Inspect raw materials and finished goods for quality
- Plan analysis schedule
- Demonstrate troubleshooting skills

UNIT-

II SEMESTER

LABORATORY OPERATION AND MAINTENANCE-II

Code: 18FTQE0210 Credits: T2 + P1 Hours/week: 3 Marks: 100

OBJECTIVES

To enable the students to

1. familiarize the students with laboratory organisation
2. enable the students to use the theoretical knowledge in operation and maintenance of laboratories.
3. familiarize the students with laboratory organisation
4. enable the students to use the theoretical knowledge in operation and maintenance of laboratories.

Specific Learning Outcomes
On Successful Completion of this course, the students will be able to

- design considerations that apply to the lab and to the areas that directly support its operation.
- understand the calibration of equipment and maintain the files and records for stock verification

UNIT I

Calibration of equipments- preparation of standard solution for calibration of equipments, method used in recording details of lab equipments for performance of falls, repairs and annual maintenance, understanding and working performance of all the equipments, apply industry standards such as GMP, GHP and HACCP.

UNIT II

Laws and regulations: regulations concerning safety and health of workers in industrial laboratories, regulations regarding electricity, fire, alcohol purchase and hazardous substances.

UNIT III

Hazards in laboratory: electricity-wiring a plug selection of proper fuse selection of proper flex safe conduct earthing; other dangers associated with electrical equipment; gas: safe LPG connections in laboratory, high pressure gas hazards, detection and handling of gas leakage, low pressure gas hazards.

UNIT IV

Fire hazards in the laboratory: the fire triangle, causes of fires, classification of fires; precautions for fire prevention and use of fire extinguishers; chemical hazards: classification of hazardous chemicals, handling of chemicals and transfer from large

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container. First Aid: first aid box; what is first aid?; placement of first aid box contents of first aid box; first aid treatment of 1ocalized injuries, bums, fractures and eye injuries.

UNIT V

Use of computers in laboratory organisation and management: components of a computer central processing unit memory input and output devices, computerised systems, overall functions, data input, data processing, data output, application packages, database software spreadsheet, software communication programmes, word processing and software data output.

Related Experience

1. Demonstration of Instrument calibration
2. Visit of industry that adopt HACCP
3. Demonstration of detection and handling hazards
4. Studying the use of fire extinguishers and demonstration of first aid
5. Generating stock of chemicals and glassware using MS- Excel
6. Visit to different food laboratory

TEXT BOOKS

3. Rao B.V.S, (1963). Operation & Maintenance of Electrical Equipment - Volume I; Media Promoters and Pub Pvt Ltd.

4. Rao B.V.S, (1967). Operation & Maintenance of Electrical Equipment - Volume II; Media Promoters and Pub Pvt Ltd.

REFERENCE BOOKS

1. Rao S, (2010). Testing Commissioning Operation & Maintenance Of Electrical Equipments; Khanna Publishers.

2. National committee for Clinical laboratory standards. 1996. Clinical laboratory manuals, 3rd ed. approved guideline 3P2-3A.Villanova, Pa.

UNIT-

FOOD MICROBIOLOGY

Code: 18FTQE0211 Credits: T2+ P1 Hours/week: 3 Marks: 100

OBJECTIVES

To enable the students to

- understand the role of microbes in food, health and disease.
- study the Microbes in relation to food spoilage, food borne diseases and food preservation.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- the factors influencing the growth of microorganisms in food
- the signs and symptoms of food spoilage and mode of prevention
- the importance of food safety

UNIT- I

Introduction of microbiology, concept and history of food microbiology; classification of microbes and structure of microbes; industrial application of microbes and their uses

UNIT- II

Environmental microbiology: microbiology of air, soil and water, food contamination and its sources.

UNIT- III

Public health: food poisoning and food safety

UNIT- IV

Food microbiology and spoilage of cereals and cereal products; fruits and vegetable; milk and milk products; poultry, fish and other sea foods

UNIT- V

Thermal inactivation of microbes: pasteurization, sterilization etc.; concept of TDT, F, Z and D values; factors affecting heat resistance; antimicrobial agents: mechanism and action.

Related Experience

1. Perform the sensitivity / threshold tests for four basic tastes.
2. Cleaning and sterilization of glassware
3. Preparation of nutrient broth, potato dextrose and nutrient agar media
4. Preparation of culture media and serial dilution
5. Gram staining and study of morphology of bacterial cell
6. Microbial examination of cereal and cereal products
7. Assessment of quality of raw milk by MBRT
8. Bacteriological analysis (*Coliform* count) of water by MPN method

UNIT-

TEXT BOOK

1. Frazier W.C and Westhoff D.C. (1992). Food Microbiology, Tata McGraw Hill Publishing Co., Ltd. New Delhi.

REFERENCE BOOKS

1. Annak.Joshua, (2001). Microbiology, Popular Book Depot. Chennai-18.
2. Ray, B. (2001) Fundamental Food Microbiology, 2nd Ed, CRC press, Boca raton FL

UNIT-

FOOD ADULTERATION

Code: 18FTQE0212 Credits: T2 + P0 Hours/week: 2 Marks: 100

Objectives

To enable the student to

1. educate about common food adulterants and their detection.
2. impart knowledge in the legislatory aspects of adulteration.
3. educate about standards and composition of foods and role of consumer.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

i. gain the knowledge of food adulteration and influencing activity of food adulterants
ii knowledge on regulatory laws and limitations for food adulteration.

UNIT I

Food adulteration – introduction of food adulteration, definition; new adulterants in foods

UNIT II

Common adulterant in milk, oil and sugar and its identification

UNIT III

Common adulterants in spices, condiments and packed powders and its identification

UNIT IV

Common adulterants in beverages, fruit juices and food colours and its identification

UNIT V

Food Safety and Standards Act 2006; vertical standards Vs horizontal standards; food safety officer- powers, procedures, role of food analyst

TEXT BOOKS

1. Srilakshmi. B, (2008). Food Science, New Age International Pvt Limited Publishers, New Delhi.
2. Shakuntala Manay, N and Shadaksharaswamy ,(2008). Food Facts and Principles. New Age International Publisher, New Delhi.

REFERENCE BOOKS

1. Titus A. M. Msagati, (2012), "The Chemistry of Food Additives and Preservatives", John Wiley & Sons Publishers.
2. Jim Smith, Lily Hong-Shum (2011), "Food Additives Data Book", John Wiley & Sons Publishers.
3. Deshpande, S.S. (2002). "Handbook of Food Toxicology", Marcel Dekker Publishers.
4. A first course in Food Analysis – A.Y. Sathe, New Age International (P) Ltd., 1999.
5. Food Safety, case studies – Ramesh. V. Bhat, NIN, 1992.
6. Food Analysis, 4th Edition. S. Suzanne Nielsen (ed.) 2010. Springer. 3rd Edition

UNIT-

FOOD SCIENCE II

Code: 18FTQE0213 Credits: T2 + P0 Hours/week: 2 Marks: 100

Objectives:

To enable the students to

1. describe the importance of various foods and their nutritive value and place in daily diet
2. study the effects of processing conditions on nutritive value of the foods

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- explain the basic concepts of cooking - and processing- methods applied to various types of food
- describe the science behind the processing and preparation of food products
- find out the importance and role of each ingredients in food products

UNIT- I

Fleshy Foods - meat, fish, poultry: Meat - composition of meat; ageing of meat and characteristics of meat-pH, tenderness, colour, water holding capacity and texture; Fish-composition of fish, organoleptic characteristics of fresh fish, spoilage of fish.

UNIT- II

Poultry - structure of egg, composition and nutritive value egg, characteristics of fresh egg, deterioration of egg quality.

UNIT- III

Milk and Milk Products: composition of milk and its constituents, various steps in processing of milk; an overview types of market milk and milk products-cheese, paneer, ice cream, ghee, butter, flavoured milk.

UNIT- IV

Introduction to food additives: meaning, need of additives, classification -functions and uses of food additives; generally recognized as safe (GRAS), tolerance levels & toxic levels in foods.

UNIT- V

Preservatives, antioxidants, colours and flavours (synthetic and natural- spices), sequesterants, humectants, hydrocolloids, sweeteners, buffering salts, anticaking agents – uses and functions in formulations; indirect food additives

UNIT-

TEXT BOOKS

1. Srilakshmi, B (2008). Food Science. New Delhi: Chennai: New Age International Private Limited. Publishers.
2. Swaminathan, M (1988). Food Science and Experimental Foods. Madras: Ganesh and Company.

REFERENCE BOOKS

1. Mudambi, R.S. and Rajagopal, M.Y. (1991). Fundamentals of Food and Nutrition. New Delhi: Wiley Eastern Limited.
2. Mudambi, R.S. and Rao. S (1987). Food Science. New Delhi: Wiley Eastern Limited.
3. Potter, N.M. and Birch, G.G. (1986). Food Science, AVI, West Port, Conn.
4. Bennion, *et al.,* (1985). Introductory Foods. New York: Macmillan.

PRACTICAL III- FOOD ADULTERATION

Code: 18FTQE0214 Credits: T0 + P4 Hours/week: 4 Marks: 100

1. Detection of adulterants in food grains and its identification
2. Detection of adulterant in milk and its identification
3. Detection of adulterant in oil and its identification
4. Detection of adulterants in sugar and its identification
5. Detection of adulterants in spices and its identification
6. Detection of adulterants in condiments and its identification
7. Detection of adulterants in packed powders and its identification
8. Detection of adulterants in beverages and its identification
9. Detection of adulterants in fruit juices and its identification
10. Detection of adulterants in food colours and its identification
11. Check list for the application of food laws
12. Visit to FSSAI

UNIT-

PRACTICAL IV- FOOD SCIENCE II

Code: 18FTQE0215 Credits: T0 + P4 Hours/week: 4 Marks: 100

1. Analysis of quality characteristics of meat
2. Study on tenderization of meat
3. Analysis of quality characteristics of fish
4. Analysis of egg quality
5. Analysis the quality of milk and milk products
6. Study on types of beverages
7. Study on quality characteristics of tea leaves and coffee seeds
8. Study on processing methods
9. Qualitative test for food additives
10. Testing of food additives in various food products
11. Visit to dairy and poultry industries

UNIT-

Third Semester

General English II

Code:18ENGU02G2 **Credit: 3 Contact Hours/week:3 Marks:100**

Objectives:

- To build on the English language skills of students initiated in the previous semester; and
- To focus on the language skills of the learners in a graded manner.

Unit I Grammar

- Adjectives
- Determiners
- Verbs & Tenses
- Subject-Verb Agreement

Unit II Listening

- Teacher/Peer Readings
- Story Narrations

Unit III Speaking Skills

- Basic conversation
- Narration of events

Unit IV Reading & Vocabulary

- Graded reading comprehension passages

Unit V Writing Skills

- Narrative paragraphs
- Note Making

Textbook:

General English II Textbook/Course Material - Prepared by the School.

Reference Book:

Seaton, Anne & Y.H. Mew.*Basic English Grammar Book 1*.Irvine: Saddleback, 2007. Print.

UNIT-

CORE PAPER: Instrumental Methods for Food Analysis

Code: 18FTQV0317 Credits: T3+P0 Hours/week: 3 Marks: 100

Course Objectives:

1. To provide students a conceptual introduction to the various instrumental techniques in food analysis
2. To understand the applications, strengths and limitations of the methods in food analysis.

Specific Learning Outcomes:

On completion of the course the student will be able to:

1. Demonstrate interaction of food by using different analytical techniques
2. Assess physico-chemical properties of foods

Unit - I

Methods of analysis, introduction and scope of various analytical methods for food samples such as food color, pH value, turbidity, etc. Uses and roles of various grinding instruments/machines for preparation of samples for analysis.

Unit-II

Methods of moisture analysis in foods – drying methods, NIR techniques, isothermic technique. Methods for separations, identification and quantification of various food components **Unit-III**

Separation methods – filteration, centrifugation, sedimentation, etc. Electrophoretic methods for protein : gel electrophoresis, paper electrophoresis, high voltage electrophoresis, starch gel electrophoresis.

Unit IV

Basic principles of spectroscopy instruments : UV, visible and fluosesence spectroscopy. Colorimetric methods of analysis for protein, amino acids, carbohydrates, sugars, vitamins, near infrared analytical techniques for moisture proteins, fats, fibers, vitamins, mineral etc Atomic absorption spectrophotometric method for minerals analysis.

UNIT-

Unit- V

Uses and basic instrument of HPLC – types of column and their applications, high pressure pumps, various type of detectors for HPLC methods. Uses and basic instrument of gas chromatograph and gas liquid chromatography (GLC) mass spectrophotometers and their applications in food analysis. Polarimetric and Refractometric techniques (refractive index) and instruments for various food.

TEXT BOOKS

1. Suzanne Nielson S (2003) Food analysis, Kluwer Academic Press, New York. Winton AL (1999) Techniques of food analysis, Allied Science, Official methods of analysis, Association
2. Fung, D.Y.C. and Matthews, R. (1991): Instrumental Methods for Quality Assurance in Foods, MarcelDekker, Inc. New York

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1. James CS (1998). Analytical chemistry of foods, Blackic Acad, UK. Winton, AL (1999). Techniques of food analysis, Allied Science Publication, New Delhi.
2. Song, DWS (1996) Mechanism and theory in food chemistry Champasian and Hall Inc. New York..
3. DeMan, J.M., Voisey, P.W. Rasper, V.F. and Stanley, D.W. (1976): Rheology and Texture in Food Quality, the AVI Publishing Co. Inc, West Port.
4. Skoog, D.A., Holler, F.H. and Nieman (1998): Principles of Instrumental Analysis Saunders College Publishing, Philadelphia.
5. Gruenwedel, D.W.; Whitaker, J.R. (editors) (1984): Food Analysis Principles and techniques, Volumes 1 to 8, Marcel Dekker, Inc., New York.
6. Pare' J.R.J.,Belanger J.M.R.: Instrumental Methods in Food Analysis, Elsevier Publications
7. Herschdoerfer, S.M. (ed) (1968 – 1987): Quality Control in the Food Industry, Vols. 1 to 4, Academic Press, London.

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https://www.labcompare.com/Food-Testing-Equipment/

https://www2.chemistry.msu.edu

https://www.khanacademy.org

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/

UNIT-

CORE PAPER: Principles of Food Preservation

Code: 18FTQV0318 Credits: T2+P0 Hours/week:2 Marks: 50

Objectives:

To enable students to

1. understand the types of spoilage occurring in foods
2. gain knowledge and acquire skill on various methods of food preservation..

Specific Learning Outcomes:

On Successful Completion of this course, the students will be able to

1. understand the concepts and principles of food preservation
2. preserve food products from plant sources

UNIT I

Introduction to food processing: Basic principles, importance of food processing and preservation, classification of foods, types of food spoilage, viz. microbiological, enzymatic, chemical and physical spoilages and their effects on food quality.

UNIT II

High temperature processing: Principles of thermal processing, Pasteurization and Sterilization, microbial destruction in batch and continuous sterilization, canning of foods, categories of foods for canning, heat penetration into food containers, calculating the process time for canned food, UHT processing, Irradiation and Microwave processing of foods.

UNIT III

Low temperature processing: Low temperature required for different foods, Refrigeration, chilling and Freezing of food, freezing principles, low and fast freezing, freezing process, determining freezing load, ammonia refrigeration systems, freezing rate, estimation of freezing time of foods, Types of freezers, thawing of frozen food.

UNIT IV

UNIT-

Processing by Moisture Removal: Evaporation, Concentration and Dehydration, Drying operation, Drying of solid and liquid foods, Types of dryers, their advantages and disadvantages, Concentration of liquid food by evaporators, Membrane processes for liquid food concentration.

Water activity (aw) in foods: Role of water activity in food preservation,

UNIT V

Use of preservatives: Sugar and salt preservation, use of chemical preservatives in food, types of fermentation of sugars, smoking, sulphating and pickling, purposes and advantages.

TEXT BOOKS

1. Srilakshmi B (2008). Food Science, New Age Publisher Pvt Limited, New Delhi.
2. Subbulakshmi G and Shobha A. Udipi (2006). Food Processing and Preservation. New Age International Publishers.

REFERENCE BOOKS

1. Desoresier,W.N. and James,N. (1987). The Technology of Food Preservation. New Delhi: CBS Publishers and Distributors.
2. Girdharilal,G.S *et al.*,(1986). Preservation of Fruits and Vegetables. New Delhi: Publications and Information Division, ICAR.
3. Sumati. R *et al.*, (1991). Fundamentals of Food and Nutrition. Madras: Wiley eastern Limited.

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http://eagri.org/eagri50/AMBE101/pdf/lec23.pdf

http://ecoursesonline.iasri.res.in/mod/page/view.php?id=4037

https://www.britannica.com/technology/thermal-processing-food-preservation

https://safefood360.com/free-resources/whitepapers/preview/thermal-processingof-food/

UNIT-

Practicals V- **Principles of Food Preservation**

Code: 18FTQV0319 Credits: T0+P4 Hours/week:4 Marks: 100

1. Demonstration of various machineries used in food preservation.
2. Demonstration on effect of blanching on quality of foods.
3. Demonstration on canning and bottling of fruits and vegetables.
4. Preservation of food by high concentration of sugar - preparation of squash
5. Preservation of food by using salt - Pickle
6. Preservation of food by using chemicals- jam
7. Drying of fruit slices in cabinet drier
8. Demonstration on drying of green leafy vegetables
9. Osmotic dehydration of foods e.g. candy
10. Drying of foods using freeze-drying & spray drying process.
12. Preservation of food by fermentation (idli, curd, dhokla etc.)
13. Visit to food preservation industries and small scale industries

REFERENCE BOOKS

- Hersom AC & Hulland ED. 1980. Canned Foods. Chemical Publ. Co.
- Larousse J & Brown BE. 1997. Food Canning Technology. Wiley VCH.
- Stumbo. 1973. Thermo Bacteriology in Food Processing. CRC, Academic Press.
- Thorne S. 1991. Food Irradiation. Elsevier.
- Zeathen P. 1984. Thermal Processing and Quality of Foods. Elsevier.

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https://frugalfamilyhome.com/food/practical-food-

https://cfmslibrary.librarika.com/search/detail/1262459

http://www.fao.org/3/v5030e/v5030e09.htm

UNIT-

CORE PAPER: Food Safety

Code: 18FTQV0320 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. provide a basic understanding of food safety.
2. provide approaches to remove the hazards
3. provide a basic acquaintance with standards and specifications

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. gain the concepts of food safety and quality assurance
2. know the quality improvement techniques, external quality control activities and also various agencies involved in food safety.

UNIT 1

Introduction to Food Safety: Definition, Types of hazards, biological, chemical, physical hazards • Factors affecting Food Safety, Importance of Safe Foods

UNIT II

Food Hazards of Physical and Chemical Origin, Introduction , Physical Hazards with common examples , Chemical Hazards(naturally occurring ,environmental and intentionally added, Packaging material as a threat, Impact on health, Control measures

UNIT III

Food Hazards of Biological Origin: Introduction,, Indicator Organisms, Food borne pathogens: bacteria, viruses and eukaryotes, Seafood and Shell fish poisoning, Mycotoxins

Management of hazards : Need , Control of parameters , Temperature control , Food storage

UNIT IV

Hygiene and Sanitation in Food labs and industries: Introduction, sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control, Personnel Hygiene

V

UNIT-

External Quality Control Activities: Inspection- preshipment inspection and inspection at the port of destination and Certification and quality marks

Food Regulatory Agencies: National and International Standard Bodies, Various organizations dealing with inspection and Testing Laboratories. Food safety inspection services (FSIS) and FSSAI and their utilization.

TEXT BOOK

1. Bhatia,R. and Ichhpujan,R.L. Quality assurance in Microbiology. CBS Publishers and Distributors, New Delhi. 2004.

REFERENCE BOOKS

1. Philip,A.C. (2001). Reconceptualizing quality. New Age International Publishers,Banglore.

2. Kher, C.P. (2000). Quality control for the food industry. ITC Publishers, Geneva.

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http://www.open.edu/openlearncreate/mod/oucontent/view.php?id=196&printable=1
https://www.fssai.gov.in/home https://www.who.int/news-room/fact-sheets/detail/food-safety https://www.nia.nih.gov/health/food-safety
http://www.cfsan.fda.gov/ http://www.cfsan.fda.gov/~lrd/haccp.html

UNIT-

CORE PAPER: Food Analysis

Code: 18FTQV0321 Credits: T2+P0 Hours/week: 2 Marks: 50

Objectives

To enable the students to

- understand different sampling techniques employed in chemical analysis of foods.
- learn various chemical methods of food analysis and proximate analysis.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

- Know the methods of sampling and handling equipments fused for food analysis.
- Perform nutrient analysis of foods

UNIT- I

Introduction to food analysis**;** Sampling, Population; Proximate Principles**;** Importance of sampling**;** Sampling technique**;** Types of sampling**;** Sampling Plan**;** Preparation of samples and Problems in sampling

UNIT- II

Analysis of foods: Moisture analysis- Oven drying method, distillation method. Total carbohydrate analysis: Alkaline ferric cyanide method, Phenol-sulphuric acid method, starch analysis. Fibre Analysis, crude fibre analysis, dietary fibre analysis by AOAC method. Protein analysis: Kjeldahl method, Biuret method, Lowry method, BCA method, Barford's method, Ninhydrin method, Amino acid analysis.

UNIT - III

Fat Analysis: Continuous solvent extraction method, Smoke point, Flash and Fire point, Iodine Value, Saponification Value, Acid Value, Peroxide Value.

UNIT-
UNIT- IV

Vitamins**:** Vitamin A by Carr-Price method, HPLC**;** Vitamin C- Ascorbic acid dichloroindophenol method**;** Vitamin D- Line test, Mineral- Calcium- Gravimetric, EDTA and redox titration; Iron – Redox titration; Phosphorous- colorimetry

.

V

Antinutritional and toxic constituents of foods, various types and chemical nature of antinutritional factors, their significance and methods of analysis. Various flavour components and additives of food and their chemical nature and analysis. Application of enzymes in food analysis.

TEXT BOOKS

1. Fennema, OR. Food Chemistry, McGraw Hill Publ. Belitz, HD and Grosch, W. Food Chemistry, Springer – Vatage Publ

REFERENCE

1. Kalia, M. Food Analysis and Quality Control. Kalyani Publishers, New Delhi. 2002.

2. Winton, A.L and Winton, K.B. Techniques of food analysis. Allied Scientific Publishers, New Delhi. 1999.

3. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003.

4. Connell, J.J. Control of fish quality. Blackwell Scientific Publications, Cambridge

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http://www.fao.org/3/Y5022E/y5022e03.htm

https://www.sciencedirect.com/topics/chemistry/food-analysis

http://www.fsis.usda.gov/Science/Hazard_Analysis_%5C%26_Pathogen_Reduction/index.asp

UNIT-

CORE PAPER: Food Safety Systems in Dairy Industries

Code: 18FTQV0322 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable student to

1. provide exposure and awareness on food safety systems in dairy industries
2. identify the sources for food standards, regulations and specifications prescribed by different certificate bodies
3. implement strong control systems through different techniques

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. gain knowledge for identifying food safety problems
2. build confidence among the students to handle the food safety projects in dairy industries.

UNIT -I

Introduction: Current status of dairy industry-production-consumption-systems and structures-safety and quality problems in imports and exports, Food safety policies in dairy industry. **UNIT -II**

Dairy Chemistry: Milk Composition – Physico Chemical properties of milk – Animal, Feed and Environmental factors influencing the composition of milk – Milk lipids, Proteins, Sugar and their biosynthesis, classes and significance – Minerals and Vitamins in Milk – Thermal stability of Milk – Freezing Point depression of Milk.

UNIT- III

Quality Analysis of Milk : Sensory analysis of Milk – Determination of Specific gravity, fat, SNF, TS, Acidity and pH in milk and their significance and interpretation – Determination and significance of MBR Test – SPC – Phosphatase activity in milk – Common adulterants in milk and their detection techniques – Advanced analytical techniques in milk and milk products

.

UNIT-

UNIT-IV

Food Safety Processes in Dairy Industry**:** General practices- Reception- chilling- clarification- Pasteurization, sterilization- Ultra high temperature treatment- grading of raw milk prevention of nutritional losses- legal requirements of packaging materials and labeling. Food Safety Legislations and Enforcement Procedures**:** Prevention of food adulterationMilk and milk product order-agricultural produce act- export quality control and inspection actlive stock importation act

UNIT- V

Consumer Food Safety Management: Development and organization on training programmes for food handler's inspectors- analysts-food borne diseases due to milk contaminants ,adulterants and contaminants in milk and milk products. Certification Bodies**:** Implementation of hazard analysis critical control point in dairy industry, food quality and safety management system. Practices on controlling contaminants in milk-guidelines on good manufacturing practices, APEDA -Effluent treatment- international certification for dairy.

TEXT BOOK

- Vijayendra, S. V. N. (2011) "*Food Safety Systems for Dairy Industries".* All India Seminar on Emerging Technologies in Dairy Industry. pp. 19- 25.

REFERENCE BOOKS

1. Food safety and standards authority of India expert group milk and milk products (2010) NDDB publication (Edition I)
2. Early R.(1995)."*Guide to Quality Management Systems for Food Industries"*. Blackie Academic.
3. Krammer A & Twigg BA.(1973). "*Quality Control in Food Industry"*. Vol. I, II. AVI Publication.
4. Dairy Science: Petersen (W.E.) Publisher – Lippincott & Company 2. Outlines of Dairy Technology – Sukumar (De) – Oxford University press 3. Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia Publishing House.
5. The technology of milk Proceesing – Ananthakrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.

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http://www.fsis.usda.gov/

http://www.cfsan.fda.gov/

www.fao.org/infoods/index_en.stm).

UNIT-

Practicals VI- Food Analysis

Code: 18FTQV0323 Credits: T0+P4 Hours/week:4 Marks: 100

1. Estimation of Moisture
2. Estimation of Ash
3. Estimation of Crude fibre
4. Estimation of sugar by Phenol Sulphuric acid method
5. Estimation of sugar by Alkaline ferric cyanide method
6. Estimation of Protein by Lowry's method and Kjeldahl Method
7. Saponification Value of oils/fats
8. Acid value of oils/fats
9. Estimation of ascorbic acid,beta carotene,and B vitamins using spectroscopic methods
10. Estimation of calcium,Phosphorus and Iron using spectroscopic methods
11. Visit to food analysis laboratories –National and Regional

REFERENCE BOOKS

Lab Manual for analysis of foods:,FSSAI 2015

https://gpadampur.files.wordpress.com/2011/11/6-2-faqc-practicals-08022014.pdf

UNIT-

Practical VII- Quality evaluation of Milk and Milk products

Code: 18FTQV0324 Credits: T0+P4 Hours/week: 4 Marks: 100

1. Determination of Activity (Titrable Acidity) of Milk.
2. Determination of fat and SNF content in milk.
3. Clot on boiling test for milk.
4. Determination of specific gravity of milk.
5. Detection of Addition of Starch, glucose, water, sodium chloride, urea, cellulose and nitrates in Milk
6. Pasteurization test
7. Test for syneresis in yoghurt and curd
8. Test for Adulterants in milk,ghee and butter 9. Preparation of flavoured milk and quality analysis
10. Visit to milk processing unit .

REFERENCE BOOKS

Lab Manual for analysis of foods: Milk and Milk products ,FSSAI 2015

WEBOGRAPHY

Online Fssai lab manual 1: manual of methods of analysis of foods milk and milk products**.**

IV Semester

Internet and Web Technology

Code:18CSAU03A2 **Credit:4 Contact Hours/week:4**
Marks:100

(Course will be offered by the Department of Computer Science Applications, GRI)

Gandhi's Life, Thought, Work

Code:15GTPU0001 Credit: 2 Contact Hours/week: 2 Marks:50

Objectives

- To enable students to understand and appreciate the principles and practices of Gandhi and their relevance in the contemporary times.
- To develop character and attitude to follow Gandhian values and responsibilities in their personal and social life.

Specific Objectives of Learning:

This will make the students:

- To understand the life of Gandhiji in-depth.
- To get introduced to the relevant Gandhian philosophies.
- To apply the Gandhian concepts in the relevant context.
- To envision the Gandhian socio-economic, political and cultural ideas.
- To get educated on Gandhian lines in a multi-dimensional way.

Unit - 1 Life of Gandhi in brief: Early life in India – London Phase – South African Adventure - Struggle for total freedom in India – Martyrdom

Unit - II Concepts of Gandhi's Philosophy, Truth and Nonviolence, Ends and Means, Right and Duties, Simple Living and High Thinking

Unit - III Gandhi's concepts and their applications: Sarvodaya, Satyagraha, SanthiSena Constructive Work

Unit - IV Gandhian Vision of Society: Self and society - Communal harmony, removal of untouchability and Equality of sexes – Policies: Decentralization of power, Gram Swaraj (Panchayatui Raj) and good governance - Economics of Swadeshi, Trusteeship, Bread Labour and Self-employment.

Unit - V Gandhian Dimension of Education: Basic Education, Adult Education, Pluralism - Multilingualism, Religions and interfaith relations- Health; Diet, Nature Cure, Education on Health, Sanitation and Hygiene.

References:

- M.K. Gandhi: (1983), An Autography of the Story of My Experiments with Truth, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (1951), Satyagraha in South Africa: Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (1983), Constructive Programme" Its Meaning and Place. Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (1948) Key to Health, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (1949), Diet and Diet Reforms, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: Basic Education, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (2004), Village Industries, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (1962), Hindi Swaraj, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (2004), Trusteeship Dreams, Navajivan Publishing House, Ahmadabad.
- M.K. Gandhi: (2001), India of my Dreams, Navajivan Publishing House, Ahmadabad.

M.K. Gandhi: Self Restraint Vs. Self Indulgence, Navajivan Publishing House, Ahmadabad.

- Arunachalam: Gandhi: (1985), The Peace Maker, Gandhi Samarak Nidhi, Madurai.
- R.R. Prabhu& UR Rao. The Mind of Mahatma Gandhi, Navajivan Publishing House.

CORE PAPER: Food Packaging

Code: 18FTQV0426 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. familiarize with different methods and materials used for packaging.
2. understand the technology behind packaging.
3. understand interaction of food with packaging & to do shelf life testing.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. the concepts and functions of food packaging
2. know packaging of food products from primary to tertiary packaging materials and method .

Unit I

Introduction to food packaging Definition, functions and requirements for effective packaging, packaging criteria Classification of packaging Primary, secondary and tertiary packaging. Flexible, rigid and Semi- rigid packaging.

Unit II

Materials for food packaging – types, various uses, merits & drawbacks. Paper, Glass, Tin, Aluminium: TFS, Polymer coated tin free steel cans, cellophane, plasticsLDPE, HDPE, LLDPE, HMHDPE, Polypropylene, polystyrene, polyamide, polyester, polyvinyl chloride **Unit III**

Different forms of food containers Boxes, jars, cans, bottle. Packaging requirements for various products- fish, meat, spices, vegetables & fruits, canned foods, dehydrated foods **Unit IV**

Modern concepts of packaging technology. Aseptic packaging, Form–Fill–Seal packaging, Edible Films, Retort pouch packaging, Easy-Open–End, Boil–In-Bags, Closures, tetra-pack, vacuum-packaging, MAP & CAP, Hyper baric storage, insect resistant packaging, intelligent packaging

Unit V

Food packaging Laws & Specifications Food packaging Laws & Specifications Quality testing of packaging materials Paper & paper boards-thickness, bursting strength, puncture resistance, Cobbs test, tearing resistance Flexible packaging materials (plastics)-yield, density, tensile strength, elongation, ϖimpact resistance, WVTR, GTR, Overall Migration Rate, seal strength. Transportation hazards and testing Oxygen interactions, moisture interchanges and aroma permeability.

TEXT BOOK

1. Potter, N. N,. Hotchkiss, J. H. Food Science . CBS Publishers, New Delhi. 2000.
2. Robertson, G.L. (2006) "Food Packaging: Principles and Practice". 2nd Edition. Taylor & Francis.

REFERENCE BOOKS

1. Sacharow, S., Griffin, R.C. (2000). Food Packaging. AVI Publishing Company, West Port, Connecticut.
2. Davis, E.G. (2004). Evaluation of tin & plastic containers for foods. CBS Publishers, New Delhi.
3. Cruess, W.V. (2003). Commercial Fruit & Vegetable Products. Allied Scientific Publishers, Delhi.
4. Raj, G .D. Encyclopaedia of Food Science, Vol 2. Anmol Publications PVT Ltd, New Delhi.
5. Ahvenainen, Raija. (2003). "Novel Food Packaging Techniques". Wood Head Publishing. 6. Mathlouthi, M. (1999). "Food packaging and Preservation. Aspen Publications,
7. Paine, F.A. and Paine, H.Y. (1983). A Handbook of Food Packaging. Leonard Hill, Glasgow, UK.

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http://www.ift.org/knowledge-center/read-ift-publications/science-reports/scientific-statussummaries/food-packaging.aspx https://gscpackaging.com/blog/the-importance-of-food-packaging/ http://www.fnbnews.com/Top-News/importance-of-food-packaging-in-food-industry-39233

CORE PAPER: Food Quality Assurance

Code: 18FTQV0427 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

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

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. understand the principles and framework of food safety.
2. apply preventive measures and control methods to minimize microbiological hazards and maintain quality of foods.
3. identify the wide variety of parameters affecting food quality.

Unit- I

Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation; Sensory *vis-àvis* instrumental methods for testing quality.

Unit- II

Concepts of quality management: Objectives, importance and functions of quality control, Quality management systems in India, Sampling procedures and plans, Food Safety and Standards Act, 2006, Domestic regulations, Global Food safety Initiative, Various organizations dealing with inspection, traceability and authentication, certification and quality assurance –PFA, FPO, MMPO, MPO, AGMARK, BIS; Labeling issues, International food standards.

Unit- III

HACCP system: Hazard analysis Critical Control Point: Definition, principles, Guidelines for the application of HACCP system.

Unit- IV

Food Quality Laws and Regulations: Quality assurance, Total Quality Management, GMP/GHP, GLP, GAP, Sanitary and hygienic practices, HACCP, Quality manuals, documentation and audits; Indian & International quality systems and standards like ISO and Food Codex, Export import policy, export documentation, Laboratory quality procedures and assessment of laboratory performance, Applications in different food industries, Food adulteration and food safety.

Unit- V

Quality Improvement Techniques**:** Quality Improvement Plans (QIP); Quality Control Circles (QCC) and Total quality management (TQM)

TEXT BOOKS

1. Bhatia,R. and Ichhpujan,R.L. (2004) Quality assurance in Microbiology. CBS Publishers and Distributors, New Delhi. .
2. Kher, C.P. (2000) Quality control for the food industry. ITC Publishers, Geneva. .
3. Philip,A.C. Reconceptualizing quality(2001)New Age International Publishers, Bangalore.

REFERENCE BOOKS

1. Yong-Jin Cho, Sukwon Kang.(2011), "Emerging Technologies for Food Quality and Food Safety Evaluation" ,CRC Press.
2. Alli Inteaz, (2003), "Food Quality Assurance: Principles and Practices", CRC Press.
3. Vasconcellos J. Andres, (2003), "Quality Assurance for the Food Industry: A Practical Approach",CRC Press.

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https://en.wikipedia.org/wiki/Quality_assurance https://www.omicsonline.org/scholarly/food-quality-assurance-journals-articles-ppts-list.php http://www.fao.org/3/v5380e/V5380E05.htm

https://www.aaps.ca/principles-of-qaqc-in-the-food-industry.php

CORE PAPER: Bakery and Confectionary

Code: 18FTQV0428 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. impart basic and applied technology of baking and confectionary and acquaint with the manufacturing technology of bakery and confectionary products.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. highlight the processing methods used in baking and confectionery industries.
2. know about the various types of food products made using baking technology.
3. able to start a small scale bakery and confectionery unit

UNIT: I

Bakery products: Types, specifications, compositions, ingredients Cereals and millets , formulations, processing, equipment, packaging, storage and quality testing.

UNIT: II

Confectionery and chocolate products: Types, specifications, compositions, ingredients, formulations, processing, equipment, packaging, storage and quality testing.

UNIT: III

Bread making : Methods, : Different types of breade and preparation of bread using different methods, quality evaluation of bread, staling of bread,

UNIT: IV

Different types of biscuits and preparation of biscuits using different methods, quality evaluation of biscuits, , Preparation of other bakery products: bun, rusks, crackers, muffins and pizza quality evaluation .

UNIT: V

Packaging and Regulation for bakery products: Packaging, storage and distribution- Food regulations and standards- National and International level.

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REFERENCE BOOKS:

- NIIR Board of Consultants & Engineers. 2014. The Complete Technology Book on Bakery Products (Baking Science with Formulation & Production), 3rd Ed. NIIR, New Delhi.
- Peter P. Grewling. 2013. Chocolates & Confections, 2nd Ed. John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
- E.J. Pyler and L.A. Gorton. 2009. Baking Science & Technology, Vol. II: Formulation & Production, 4th Ed. Sosland Publishing Company, Kansas City, MO, USA.
- John J. Kingslee. 2006. A Professional Text to Bakery and Confectionery. New Age International, New Delhi.
- Harold Corke, Ingrid De Leyn, Nanna A. Cross, Wai-Kit Nip, Y.H. Hui. 2006. Bakery Products: Science and Technology. Blackwell Publishing Ltd., Oxford, UK.
- E.B. Jackson. 1995. Sugar Confectionery Manufacture, 2nd Ed. Springer-Verlag, US.
- Zhou. W, Hui Y,H; (2014), "Bakery Products Science and Technology", 2nd Edition, Wiley Blackwell Publishers,
- Stanley P. Cauvain, Linda S. Young, (2008), "Baked Products: Science Technology and
- Practice". John Wiley & Sons Publishers.
- Ouaouich and Peter Fellows. 2004. Cereal Milling and Bakery Products. Production Methods, Equipment and Quality Assurance Practices. FAO Publications, Rome.

Fellows, P.J., Axtell, B. and Dillon, M. 1995. Quality Assurance for Small Scale Rural Food Industries, FAO Agricultural Services Bulletin # 117, FAO Publications Assuring food safety and quality.2003.FAO Food and Nutrition Manual., FAO Publications, Rome.

WEBOGRAPHY

https://en.wikipedia.org/wiki/Confectionery

https://www.bakingmad.com/recipes/confectionery

https://archive.lib.msu.edu/MMM/JA/11/b/JA11b019.pdf

CORE PAPER: Quality Evaluation of Food Grains and its Products

Code: 18FTQV0429 Credits: T4+P0 Hours/week: 4 Marks: 100

Objectives

To enable students to

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

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. create awareness about the processing of major cereals like paddy, maize
2. study the storage and handling techniques of cereals
3. gain knowledge on processing and milling of cereals

Unit- I

Introduction, Grain structure-wheat,rice and millets, Grain Quality Parameters, Length and Width, Aspect Ratio, Texture, Chalkiness, Whiteness, Damaged / discolored grains,

Breakage and cracking, Immature, Yellowing, Adulteration, Yield, Technical Terms

Unit- II

Manual Techniques for Grain Analysis, Grain analysis methods, Approximately circular seed, Grain size analysis, Sieving Method, Manual and mechanical sieving: Single sieve and sieve set sieving: Conventional Image Based Grain Analysis Techniques, Automatic grain quality inspection

Unit-III

Grain Analysis Standards, Importance of standards, Rice standard organizations, Bureau of Indian Standards (BIS), Directorate of Marketing & Inspection (DMI), Department of Food & Public Distribution (DFPD), CODEX Standards, The African Organisation for Standardisation Standards (ARSO : ARS 464 (English) : Milled Rice Specification 2012), Cambodia milled rice standards(CS053:2014-Rev.1)(Intenational Financial Corporation 2014), United States standards for rice by USDA, Food and Agriculture

Organisation of United Nations

Unit IV

Biodeterioration**:**Moulds and mycotoxins**,** The significance of mycotoxins**.**The interaction of mycotoxins**,**The control of mycotoxins**,** Sampling and analysis**.** Rodent and insect control on storage of grains

Unit- V

Quality evaluation of grain products: Microscopic structure of grain starches, Physico chemical properties of flours,shelflife analysis of grain flours, determination of intentional and unintentional adulterants in grain flours and its products.

TEXT BOOKS

1. Boxall, R.A. and Gough, M.C. (1992a) Investigation of technical problems associated with the distribution of food grain from temperate to tropical regions. NRI Report 4: A study of a shipment of food-aid maize to Angola. Chatham, UK: Natural Resources Institute. 71pp

REFERENCE BOOKS

1. Boxall, R.A. and Gough, M.C. (1992b) Investigation of technical problems associated with the distribution of food grain from temperate to tropical regions. NRI Report 5: A study of a second shipment of food-aid maize to Angola. Chatham, UK: Natural Resources Institute. 40pp.
2. Conway, J.A., Daplyn, P.F., Clarke, P.A. and Twiddy, D.R. (1992) A study in the determination of quality/value relationships in rice. NRI Bulletin 55: Chatham, UK: Natural Resources Institute. 45pp.
3. Foster, G.H. (1982) Drying Cereal Grains. In Storage of Cereal Grains and Their Products. C M Christensen, Ed. St Paul: American Association of Cereal Chemists Inc. 79116.
4. Jewers, K., Coker, R.D., Jones, B.D., Cornelius, J., Nagler, M.J., Bradburn, N., Tomlins, K., Medlock, V., Dell, P., Blunden, G., Roch, O.G. and Sharkey, A. (1989) Methodological developments in the sampling of foods and feeds for mycotoxin analysis. Journal of Applied Bacteriology Symposium Supplement: 105S-116S.

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https://pdfs.semanticscholar.org/94e1/4d258349e588ff4cbe7f89a445c419467581.pdf https://www.sciencedirect.com/topics/food-science/grain-quality

Practical VIII- Quality Evaluation of Food Grains and its Products

Code: 18FTQV0430 Credits: T0+P4 Hours/week: 4 Marks: 100

1. Determination of refractions in grain: Filth,karnal bunt and ergot
2. Microscopic structure of grains
3. Evaluation grain quality parameters: Length, width, and aspect ratio, texture,chalkiness, whiteness,damaged and discolored grains,immature and yellowing.
4. Grain analysis: Shape,Seiving,
5. Estimation of Gluten Content of flour.
6. Estimation of moisture in grains
7. Determination of sedimentation power of flour
8. Determination of adulterants in flour
9. Study of physic chemical properties of flours
10. Nutrient quality of grain flours-protein,fat,carbohydrate,fiber,ash and vitamins 11. Visit to rice and millet processing units and regional institutes

Reference:

- Manual of methods of analysis of foods,cereals and cereal products,FSSAI,2016

Practical IX- Quality Evaluation of Bakery and Confectionery Products

Code: 18FTQV0431 Credits: T0+P4 Hours/week: 4 Marks: 100

Introduction to Bakery and Confectionery Equipments

Quality evaluation of raw ingredients: Flour, egg, milk, yeast, fat, sugar and other ingredients

Determination of Gluten content in the flour and its suitability for bakery products

Determination of reducing and non reducing sugar in chocolates

Test for the chocolate components of filled chocolate.

Assessment of quality of the prepared bakery and confectionery products: Physical, nutritional, functional and microbial:

Bread , Pizza base and Buns

Butter cake and Sponge cake. Cookies and biscuits

Chocolates- Hard and soft Fudge,toffee

Visit to bakeries and confectioneries unit

References Books

1. **Lab manual for Beverages. Sugar and Confectionery ,FSSAI 2015**
2. Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
3. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
4. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers. 4. Barndt R. L. (1993).
5. Fat & Calorie – Modified Bakery Products, Springer US. 5. Samuel A. Matz (1999). Bakery Technology and Engineering, PAN-TECH International Incorporated.
6. Faridi Faubion (1997). Dough Rheology and Baked Product Texture, CBS Publications.
7. Samuel A. Matz (1992). Cookies & Cracker Technology, Van Nostrand Reinhold

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https://onlinelibrary.wiley.com/doi/full/10.1111/j.1745-4557.2011.00417.x

V Semester

CORE PAPER: Accounting and Book Keeping

Code: 18FTQV0533 Credits: T4+P0 Hours/week: 4 Marks: 100

Objective:

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

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. maintain records in a food testing laboratory
2. gain knowledge on financial management

Unit I

Accounting:Definition – investors, creditors, regulators, suppliers. Fields of accounting – financial accounting, management accounting, financial and internal ,external auditing, tax accounting and cost accounting, accounting information system. Accounting firms- standard setters. Accounting information system **Unit II**:

Accounting principles: Definition, standard rules and guidelines , GAPP, five important principles of modern accounting –the revenue principle, expense principle, matching, cost and objectivity.

Unit III:

Introduction to book keeping: Daybooks Double-entry system General ledger T Accounts Trial balance Journal. Debits and credits Chart of accounts Petty cash –Imprest system, bank reconcillation-ledger,single entry system, Debtors and creditors

Unit IV:

Assets and liabilities: Equity – income , expenses , depreciation , accruals, pre payments, VAT, GST

UNIT V

Venture capital characteristics – stages – institutions – capital market structure – SEBI Guidelines – recent trends in capital market –inflation and financial markets – financial decisions- budgeting decisions.

TEXT BOOKS

1. Gupta.K.Sharma and R.K.Sharma ,"Financial management"- Kalyani publishers.
2. Prasanna Chandra " Financial management"-Tata McGraw Hill.

REFERENCE BOOKS

1. Pandey .I.M. (2009) "Financial Mnagement", 9 th edition , Vikas Publications,
2. Jain. S.P. and Narang , K.L. (2005) "Cost Accounting" ,Kalyan Publishers, New Delhi.

WEBOGRAPHY

https://www.accountingcoach.com/bookkeeping/explanation

https://en.wikipedia.org/wiki/Bookkeeping

CORE PAPER: Food Hygiene

Code: 18FTQV0534 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. understand and impart knowledge of importance of food hygiene, sanitation, and safety during food processing unit.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. know the principles and applications of sanitation in food industry.
2. know about the various types of Sanitation techniques applicable in the food industry
3. gain an understanding of food hygiene, sanitation and safety during food processing unit operations.

Unit- I

Sanitation and Health: Definition, importance of sanitation, application of sanitation to food industry and food service establishments; Microorganisms control of and microbial growth in food.

Unit- II

Hygiene and Food Handling: Purchasing and receiving safe food, food storage, sanitary procedures in food preparation, serving and displaying of food, special food operations.

Unit- III

Environmental Sanitation: Location and layout of premises, constructional details, sanitary requirements for equipments, guidelines for cleaning equipments, cleaning procedures, pest control, water supply, storage and waste disposal, environmental pollution.

Unit- IV

Hygiene Practices in Food Industry: Introduction, necessity, personnel hygiene, sanitary practices, management and sanitation, safety at work place.

Unit- V

Sanitation regulations and Standards: Introduction, regulatory agencies, control of food quality, local health authority. Food sanitation check lists given by FSSAI.

TEXT BOOKS

1. Marriott, Norman (2013), "Principles of Food Sanitation", Springer Science & Business Media Publishing

REFERENCE BOOKS

1. Roday S, (2011) (2002), "Food Hygiene and Sanitation", McGraw Hill Publishing Company Limited.
2. Lelieveld, John Holah, David Napper, (2014), "Hygiene in Food Processing: Principles and Practice", Elsevier Publications.

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http://www.open.edu/openlearncreate/mod/oucontent/view.php?id=187&printable=1

https://www.sciencedirect.com/topics/food-science/food-hygiene

http://www.open.edu/openlearncreate/mod/oucontent/view.php?id=193&printable=1

https://www.who.int/foodsafety/areas_work/food-hygiene/en/

https://www.fsis.usda.gov/wps/portal/fsis/topics/regulatory-compliance/compliance-guides-index/sanitation-performance-standards/sanitation-compliance-guide

CORE PAPER: Sensory Evaluation

Code: 18FTQV0535 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. understand different aspects of sensory science and its application.
2. use sensory evaluation as an analytical tool.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. understand importance of sensory perception to food quality
2. know the scientific method used to evoke, measure, analyze and interpret those responses to products

UNIT: I

Introduction, definition and importance of sensory evaluation in relation: to consumer acceptability and economic aspects; factors affecting food acceptance. Terminology related to sensory evaluation.

UNIT: II

Principles of good practice: the sensory testing environment, test protocol considerations, Basic principles: Senses and sensory perception, Physiology of sensory organs, Classification of tastes and odours, threshold value factors affecting senses, visual, auditory, tactile and other responses.

UNIT: III

Discrimination Tests, Procedure: Types of tests – difference tests\ (Paired comparison, due-trio, triangle) ranking, scoring, Hedonic scale and descriptive tests. Panel selection, screening and training of judges; Requirements of sensory evaluation, sampling procedures; Factors influencing sensory measurements.

UNIT: IV

Consumer Research – Affective Tests: Objectives. Methods, types or questionnaires, development of questionnaires, comparison of laboratory testing and Consumers studies, limitations.

UNIT: V

Interrelationship between sensory properties of food products and various instrumental and physico-chemical tests; Quality Evaluations Application of sensory testing: sensory evaluation in food product development, sensory evaluation in quality control.

TEXT BOOKS

1. Srilakshmi,B., (2008). Food Science, New Age International (P) Limited, New Delhi.
2. Manay,S., Shadaksharaswamy,M., (2008). Food Facts and Principles, New Age International (P) Limited., New Delhi.

REFERENCE BOOK

1. Amerine, M.A., Pangborn, R.M. and Rossles, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, London.
2. Jellinek, G. 1985. Sensory Evaluation of Food - Theory and Practice. Ellis Horwood.
3. Lawless, H.T. and Klein, B.P. 1991. Sensory Science Theory and Applicatons in Foods. Marcel Dekker.
4. Piggot, J.R. 1984. Sensory Evaluation of Foods. Elbview Applied Science Publ.
5. Potter, N.N. and Hotchleiss, J.H. 1997. Food Science. 5th Ed. CBS Publishers, Delhi.
6. Rai, S.C. and Bhatia, V.K. 1988. Sensory Evaluation of Agricultural Products. Indian Agricultural Statistics Research Institute (ICAR), New Delhi.
7. Stone, H. and Sidel, J,L. 1985. Sensory Evaluation Practices. Academic Press.
8. Harry, T. Lawless, Hildegarde Heymann. 2010. Sensory Evaluation of Food: Principles and Practices. 2nd Ed., Springer, New York or Dordrecht Heidelberg, London.

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CORE PAPER: Processing of Beverages and Spices

Code: 18FTQV0536 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. knowledge of beverage and spices, types of manufacturing process involved in different manufacturing industries.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. study about the various beverages and spices and their products .
2. provide a technical view of beverages and spice processing.

Unit- I

Introduction : Types of beverages and their importance, status of beverage industry in India, Manufacturing technology for juice-based beverages, synthetic beverages; technology of still, carbonated, low-calorie and dry beverages, isotonic and sports drinks; role of various ingredients of soft drinks, carbonation of soft drinks.

Unit- II

Manufacturing process of beverages: Beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, Dairy-based beverages.

Unit- III

Types of coffee and tea: Chemical composition and processing of tea and coffee and their quality assessment. Types of tea: black tea, green tea, oolong tea. Types of coffee: Vaccum

coffee, drip coffee, iced coffee. Espresso coffee, instant coffee. Decaffeination of Coffee types of decaffeination

Unit- IV

Introduction, classification, composition and functions; Major international quality specifications of spices; Spice processing, spice reconditioning, spice grinding, post processing treatments of major spices: Pepper, cardamom, ginger, clove, nutmeg, vanilla, cinnamon, chilli and turmeric and Minor spices- cloves, leafy spices, bay leaf, oregano.

Unit- V

Spice extractives: Value added spice products: Spice volatile oils, spice blends,spice oleoresins, Use of spice extractives, replacement of spices with oils and oleoresins, alternative products, essential and encapsulated oils, salad dressings and seasonings.

TEXT BOOKS

1. Manay, N.S, Shandaksharaswamy, M., (2004), "Foods- Facts and Principles", New Age International Publishers, New Delhi,

2. Potter, N.N, Hotchkiss, J.H.(2000), "Food Science". CBS Publishers, New Delhi.

3. Srilakshmi, B. Food Science (3rd Edition) (2003), New Age International (p) Limited Publishers, New Delhi

REFERENCE BOOKS

1. Nicholas Dege. (2011), "Technology of Bottled water". Blackwell publishing Ltd, UK.
2. J.S.Purthi, (2003) (2001), "Minor Spices and Condiments: Crop Management and Post Harvest Technology", ICAR publication, 1st Edition
3. Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing. D. K. Salunkhe, S. S. Kadam, CRC Press, 1st Edition, 1995.

4. N.K.Jain,(1989), “Global Advances in Tea Science”, Aravali Books International, 1st Edition

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https://www.foodsafetymagazine.com/magazine-archive1/octobernovember2012/category-dry-ingredients-quality-assurance-and-food-safety-of-powderedingredients/

https://old.fssai.gov.in/Portals/0/Pdf/Draft_Manuals/SPICES_AND_CONDIMENTS.pdf

https://www.starwest-botanicals.com/content/quality_assurance.html

CORE PAPER: Processing of Fruits and Vegetables

Code: 18FTQV0537 Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives

To enable students to

1. proper post-harvest handling
2. technologies of fruits and vegetables and to know the process of development of fruit and vegetable processing products.

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. know about the status of fruit and vegetable production in India with importance to losses.
2. study the processing of fruits and vegetables.
3. impart knowledge about the various products and study the various methods of processing fruits and vegetables

Unit- I

Introduction; Composition and nutritive value of fruits and vegetable; Factors affecting composition and quality of fruits and vegetables; Quality requirements of raw materials for processing; sourcing and receiving at processing plants, primary processing: grading, sorting, cleaning, washing, peeling, slicing and blanching

Unit- II

Spoilage of fruits and vegetables: Different types of spoilage in fruits and vegetables. Spoilage during storage of fruits and vegetables and their prevention; General methods of preservation of whole fruits/vegetables and processed fruits and vegetables; Spoilage of pickles; Methods of preparation, curing techniques, defects, and remedies. Types of preservatives commonly used in Fruits and vegetables processing industry, permissible limits of usage of preservatives.

Unit- III

Processing of fruits and vegetables: Dehydration of fruits and vegetables using various drying technologies like sun drying, solar drying (natural and forced convection), osmotic, tunnel drying, fluidized bed drying, freeze drying, convectional and adiabatic drying; applications to raisins, dried figs, vegetables, intermediate moisture fruits and vegetables; Fruit powders using spray drying; Technology of extraction of juices from different types of fruits.

Unit- IV

Manufacture of Fruit products: Manufacturing process of juice, soup, puree, and paste. Jams, Jellies, and marmalades: selection, preparation, production; Difference between jam and jelly; Theory of gel formation, failure, and remedies in jam and jelly making. General principles and manufacturing processes of preserves, candied fruits, glazed fruits, crystallized fruits **Unit- V**

Manufacture of vegetable products: Manufacturing process of sauce, ketchup, vegetable juices, and concentrated products.

TEXT BOOKS

1. Manay, N.S, Shandaksharaswamy, M., (2004), "Foods- Facts and Principles", New Age International Publishers, New Delhi, 2. Potter, N.N, Hotchkiss, J.H.(2000), "Food Science". CBS Publishers, New Delhi.

3. Srilakshmi, B. Food Science (5rd Edition) (2015), New Age International (p) Limited Publishers, New Delhi,

Reference Books

1. Nirmal Sinha, Y. H. Hui, et al; (2010), "Handbook of Vegetables and Vegetable Processing", John Wiley & Sons.
2. Olga Martin-Belloso, Robert Soliva Fortuny, (2010), "Advances in Fresh-Cut Fruits and Vegetables Processing". CRC Press.
3. Jongen (2002), "Fruit and Vegetable Processing: Improving Quality", Elsevier Publications.

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http://www.fruitandvegetable.ucdavis.edu/files/217117.pdf

http://www.actahort.org/books/379/379_70.htm

https://pubag.nal.usda.gov/download/26087/PDF

CORE PAPER: **Practical X- Quality Analysis of Beverages and Spices**

Code: 18FTQV0538 Credits: T0+P4 Hours/week: 4 Marks: 100

1. Preparation of sample for analysis
2. Determination of Extraneous Matter and other Refractions in Whole spices
3. Determination of Moisture (Dean and Stark Toluene Distillation Method), (Karl Fischer Method)
4. Preparation of extracts using different solvents to study its secondary metabolites
5. Determination of phytochemicals in spice extracts-curcumin, Piperine
6. Detection of mineral oil in pepper, Argemone seeds in Mustard
7. Preparation of coffee and tea samples for analysis
8. Determination of colour,soluble and insoluble ash,alkalinity in coffee and tea,coco powder
9. Dertermination of caffeine content in coffee andTest for solubility in hot water-instant coffee 10. Test for colouring substance and microscopic examination

REFERENCE BOOK

1. **Lab manual for spices and condiments.FSSAI 2015**
2. **Lab manual for Beverages. Sugar and Confectionery ,FSSAI 2015**

Webography:

https://www.fssai.gov.in/home/food-testing/food-testing-manual.html

CORE PAPER: Practical-XI Quality Analysis of Fruits and Vegetables

Code: 18FTQV0539 Credits: T4+P0 Hours/week: 4 Marks: 100

1. Thermally processed fruits and vegetables (Canned/Bottled/ Flexibly Packaged): Physical examination,can condition,drained weight,determination of soluble solids,
2. Test for brix using refractometer for fruit and vegetable jams,jellies,squash and syrups
3. Test for insoluble solids-marmalades,syrups
4. Determination of Ph,total sugars and titrable acidity in processed fruits and vegetable products
5. Determination of Vitamin C in citric processed fruits
6. Determination of mineral impurities in processed vegetables and fruits
7. Determination of Total soluble solids free of added salt (in Vegetable juices and Tomato juice),soup powders, pulp
8. Determination of moisture content in Vegetable juices and Tomato juice),soup powders, pulp
9. Microbiological analysis of thermally processed fruits and vegetables
10. Visit to fruit and vegetable processing unit

REFERENCE BOOKS

Lab manual for fruits and vegetables,FSSAI,2016

WEBOGRAPHY:

https://www.fssai.gov.in/home/food-testing/food-testing-manual.html

VI SEMESTER

CORE PAPER: Design and Development of Food Testing Lab

Code: 18FTQV0641 Credits: T4+P0 Hours/week: 4 Marks: 100

Objective(s)

1. To design and develop labs for food testing operations

Specific Learning Objectives

1. Use details of space, equipments and cost to design a lab that meets quality standards
2. Design labs with all facilities to enable for accreditation from national bodies.

UNIT I

Types of Laboratory, Main Laboratory, Multi- location laboratory- Multi-location,Satellite laboratory, Field laboratory, Mobile laboratory, Food Laboratory, Setting up a Regulatory Food Analysis Laboratory

UNIT II

Designing Food lab, Layout of different food laboratory, space, materials, cupboard, shelves, waterlines, lighting, ventilation adopted in different units of food testing lab. Overall Space Utilization. Guidelines , Security Laboratory Signage's ,Corridors and aisles ,Exits/Doors and Windows , Flooring , Walls and ceiling, Sinks Storage , Chemical Storage in the Laboratory/Bulk storage , Gas Cylinder Storage and Gas Lines

UNIT III

Location of storage equipment and spacing, Planning storage spaces, Safety and security of stores , Work simplification, working heights in relation toequipment

UNIT IV

Laboratory Building Requirements and Design, Infrastructure of the food testing lab. Guidelines and regulation in designing food testing lab by FSSAI.

UNIT V

Laboratory and Personnel Safety , Safety Equipment , Safety design in labs , Electrical Services and Safety , Lab Furniture, Work Tables , Waste Disposal : Chemical Waste, Biological Waste.

TEXT BOOKS

1. Peters Max. S., Timmerhaus Klaus D.and Ronald E West., Plant Design and Economics for Chemical Engineers, V Edition McGraw Hill.2003
2. Coulson, J. M. and Richardson J. F., Chemical Engineering, Pargamon Press, vol. 6 1989.

REFERENCES

1. Evans, F. L., "Equipment Design Handbook", Gulf Publishing Company, 2nd Edition 1979.
2. Perry, R.H and Chitton, Perry's Chemical Engineers Handbook, McGraw Hill, NewYork, 7thEdition, 1997

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https://old.fssai.gov.in/Portals/0/Pdf/GFLP_Document_06_09_2016.pdf

https://www.fddiindia.com/Services-new/food-testing-noida.php

https://www.manufacturing.net/article/2015/05/importance-laboratory-testing-food-production

CORE PAPER: FSSAI Regulations on Food Testing

Code: 18FTQV0642 Credits: T4+P0 Hours/week: 4 Marks: 100

Objectives

To enable students to

1. Know the latest regulations laid by FSSAI
2. Apply the practical experience to check the quality of the products as per the regulations laid by FSSAI

Specific Learning Outcomes

On Successful Completion of this course, the students will be able to

1. To identify foods of good quality.
2. To explore the lab standards and apply the same in interpretation of result **Unit I**:

Role of FSSAI in standardising the proper quality standards – food regulations – standards – quality standards – improving quality- structure of food lab ecosystem by FSSAI- new regulationsof FSSAI 2018 –licensing – HACCP.

Unit II:

Regulations laid for drinking water: Microbiological requirement, organoleptic and physical properties ,general parameters concerning substances undesirable in excessive amount, , parameters concerning toxic substances, parameters concerning radio- active residues, pesticide residues.

Unit III:

Regulations laid for dairy products and perishable food items:Specifications for milk, derivatives of milk, condensed milk, infant milk products, milk derivatives processed butter and cheese., online FSSAI license for milk products.Quality standards for meat and meat products, fish, poultry.

Unit IV:

Regulations laid for cereals and bakery products: standards laid down for cereal and cereal products, maida,rice, drum wheat maida, starches, dried fruits ,infant foods, ,instant noodles, fortified atta, Establishment of a bakery, location and surroundings, design and facilities, control of operation, food traceability, quality control, product information labelling, consumer awareness.

Unit V:

Regulations laid for vegetables and fruits: Food safety- pesticide residue levels, artificial ripening, quality standards for exports, Harvesting techniques.

1. Lab Manuals of FSSAI -2015-2018

https://old.fssai.gov.in/Portals/0/pdf/FSSAI_SoPs_for_Imports.pdf

www.fssai.org

CORE PAPER: FOOD LAWS AND LEGISLATIONS

Code: 18FTQV0643 Credits: T4+P0 Hours/week: 4 Marks: 100

Objective(s)

1. To provide an opportunity to learn food safety and management systems
2. to learn food law and quality standards.

Specific Learning Objectives:

1. To understand about the important parameters of food safety systems.
2. To get know International food laws
3. To guide the manufacturing industries, process industries which are involved in food business.

UNIT I

Principles of food safety and quality –Food Safety System - Introduction to Risk Analysis, Risk Management, Risk Assessment, Risk Communication. Background and Structure,

GHP, GAP, GMP, PRP, OPRP, CP, CCP, Principles and Implementation of HACCP.

Traceability and authentication, Certification and quality assurance.

UNIT II

International/ National/Regional Level : The Structure of Food Law, Food Regulation What Should be Regulated?, Laws and Regulations to Prevent Adulteration and Cross Contamination, Microbial Contamination, Hygienic Practice, Chemical and Environmental Contamination, Food Additives, Labeling, Food Laws and Regulations at the International Level for Harmonization.

UNIT III

National Standards : PFA, FPO, MMPO, MPO, AGMARK, BIS, Legal Metrology, Environment and Pollution Control Board, Factory Licence. International food standards., Trends in Food Standardization, An Overview and structure of 9001:2000/2008, Clause wise Interpretation of ISO 9001:2000, Case Studies, An overview and Structure of 22000:2005,

Clause wise Interpretation of ISO 22000:2005, Case Studies. FSSAI –an overview

UNIT IV

International Bodies Dealing In Standarization :International Standardization Organization (ISO), Joint FAO/WHO Food Standards Program. Codex Alimentarius Commission (CAC), Other International Organizations Active in Food Standard Harmonization.

Advantages of Utilizing International Standards.

UNIT V

American National Standard Institute (ANSI), ASEAN Consultative Committee for Standards and Quality (ACCSQ), Arab Industrial Development and Mining Organization (AIDMO), African Regional Organization for Standardization), European Committee for Standardization (CEN) Pacific Area Standards Congress (PASC), Scientific and Other Regional Organizations Interested in Agricultural and Future Trends.

TEXT BOOKS

REFERENCES

1. Neal D. Fortin. 2009. Food regulation, Wiley Publishers.
2. Naomi Rees. David Watson. 2000. International standards for food safety, An Aspen Publications.
3. O'Rourke. 2005. European Food law,

www.fao.org

www.who.org

www.fssai.org

CORE PAPER PRACTICAL – XII

SOP DEVELOPMENT

Code: 18FTQV0644 Credits: T0+P2 Hours/week: 2 Marks: 50

This enable the students to,

- Know how to write a standard operating procedure
- Able to make clear cut guidelines while writing procedures
- Understand the concept of good food laboratory practice

Introduction:

SOP-Overview, purpose ,benefits , writing styles- simple steps format – flow chart format- hierarchial steps format

SOP process:

Review and approval – frequencies of revisions and reviews. Checklists: document control, SOP Document - tracking and archival.- Approval format: Title page, table of contents – text, Types of SOP: Technical SOP – Text information guidelines, Administrative SOP Text information guidelines – examples of SOP

1. SOP development for analysis of proximate principles
2. SOP development for Vitamin analysis
3. SOP development for Mineral analysis
4. SOP development for Phytonutrient analysis
5. SOP development for test Physico chemical properties
6. Sop development for weighing,sample preparation for various analysis
7. SOP development for handling of preparatory equipments-Hot air oven,digital balance,water bath,muffle furnance and incubator
8. SOP development for analytical equipments-UV Spectrophotometer
9. SOP development for working procedures in laboratory
10. Visit to NABL accredited food labs.

References:

1. American Society for Quality. 2004. ANSI/ASQC E4-2004, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs. Milwaukee, WI.
2. American Society for Testing and Materials. ASTM D 5172-91 (2004), Standard Guide for Documenting the Standard Operating Procedures Used for the Analysis of Water. 2004.
3. American Society for Testing and Materials, West Conshohocken, PA.

WEBOGRAPHY

https://old.fssai.gov.in/Portals/0/pdf/FSSAI_SoPs_for_Imports.pdf

ELECTIVES

PRODUCT DEVELOPMENT,TESTING AND MARKETING

Elective: Credits: T3+P0 Hours/week: 3 Marks: 100

Objectives:

1. To understand various aspects of development of a food product
2. To acquire knowledge on the importance of Consumer Research, Finance and Communication **Specific Objectives of Learning:**

on successful completion of these units, students are expected:

1. To appraise the main features and trends of a specific food product product within an appropriate market setting
2. To understand the development cycle of the food product..
3. To develop and justify technical specifications for the new product **Contents:**

UNIT- I

New Food Products development :Definition, classification, characterization, factors influencing new product development – social concerns, health concerns, impact of technology and market place influence.

UNIT- II

Generation of New Product Ideas: Internal sources of idea, External sources of ideas and market place analysis. Screening of the ideas: Team approach and involvement of various departments, objectives of screening, criteria for screening ideas.

UNIT - III

. Phases in Food Product Development-prototype, standardization, Sensory Evaluation: Descriptive, thershold and acceptance test. Shelf life testing- types of shelf life testing mode of food deterioration. Technical development – recipe development and scale up. Food safety and food Spoilage .

UNIT - IV

Newer food stabilizing systems : Thermal processing, ohmic heating, stabilizing with high pressure, other non-thermal stabilizing systems, controlled / modified atmosphere packaging, irradiation, hurdle technology, low temperature stabilization -Use of various new ingredients to suit product functions.

UNIT - V

Packaging- types, new trends in packaging materials and methods suitable for various products. Graphic designing and nutritional labeling.

Test Marketing: Evaluating results and analyzing. Costing of the products, methods of pricing

References:

1. Fuller G W (1994) New Food Product Development : From Concept to Market place CRC Press, New York
2. Man C M D and Jomes A A (1994) Shelf life Evaluation of Foods. Blackie Academic and Professional, London
3. Olickle, J K (1990) New Product Development and value added. Food Development Division, Agriculture, Canada
4. Graf E and Saguy I S (1991), Food Product Development : From concept to the Market Place, Van Nostrand Reinhold New York

BY PRODUCTS AND WASTE UTILISATION

Elective: Credits: T3+P0 Hours/week: 3 Marks: 100

. OBJECTIVES :

1. To develop an understanding among the students on a. Origin and type of waste and by products, waste identification, classification and composition.
2. Need for treatment and utilization.
3. Impact of waste disposal on environment.

Specific Objectives of Learning:

on successful completion of these units, students are expected:

1. To utilize waste from food industries and develop novel products
2. Align with the Legal and statutory requirements for food waste handling, treatment and disposal

UNIT: I

Types and formation of by-products and waste; Magnitude of waste generation in different food processing industries; Uses of different agricultural by-products from rice mill, sugarcane industry, oil mill etc., and fishery by – products from fish processing industry.

UNIT: II

Concept, scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues.

UNIT: III

Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization; Waste utilization from fish Processing Industry – Bio fuel, dietic products, Pigments, Packaging application, Cosmetics, Therapeutic products etc.

UNIT: IV

Waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermin-composting, Pretreatment of waste: sedimentation, coagulation, flocculation and floatation, Secondary treatments: Biological and chemical oxygen demand for different food plant waste– trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons, Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters , phosphorous, sulphur, nitrogen and heavy metals removal, Assessment.

UNIT: V

Treatment and disposal of solid waste; and biogas generation, Effluent treatment plants, Environmental performance of food industry to comply with ISO-14001 standards.

TEXT BOOKS

1. Shewfelt, R.L. and Prussi, S.E. 1992. Post-Harvest Handling – A Systems approach, Academic Press Inc.
2. USDA. 1992. Agricultural Waste Management Field Hand book. USDA, Washington DC..
3. V.K. Joshi & S.K. Sharma. Food Processing Waste Management: Treatment & Utilization. New India Publishing Agency

REFERENCE BOOKS

1. Markel, I.A. 1981. Managing Livestock Waste, AVI Publishing Co.
2. Pantastico, ECB. 1975. Post Harvest Physiology, Handling and utilization of Tropical and Subtropical fruits and vegetables, AVI Pub. Co..
3. Vasso Oreopoulou and Winfried Russ (Edited). 2007. Utilization of By-products and Treatment of waste in the Food Industry. Springer Science & Business media, LLC 233 New York.
4. Weichmann J. 1987. Post Harvest Physiology of vegetables, Marcel and Dekker Verlag

ELECTIVE Processing of Fish , Meat and Poultry Products

Code: Credits: T0+P43 Hours/week: 3 Marks: 100

Objectives :

- To provide an extensive description of meat, fish and poultry processing
- To introduce the latest technologies , manufacturing processes and tools for effective control of safety and quality during processing

Specific Objectives of Learning:

on successful completion of these units, students are expected:

To
- understand the processing techniques involved in fish,meat and poulty products.
- To develop safe and quality fleshy food products

UNIT: I

Sources and importance of fish, meat and poultry; Status of fish, Meat and poultry industry in India; Pre-slaughter operations and slaughtering operations for animals, fish and poultry; Evaluation of animal carcasses; Factors affecting post-mortem changes, properties and shelf life of meat;

UNIT: II

Mechanical deboning, grading and aging; Eating and cooking quality of meat; Preservation of meat by chilling, freezing, pickling, curing, cooking and smoking, dehydration, radiation, chemical and biological preservatives.

UNIT: III

Meat tenderization; Meat emulsions; Meat cutting and handling; Preparation, preservation and equipment for manufacture of smoked meat and its quality evaluation; Preparation, packaging and equipment for manufacture of dehydrated meat products and their quality evaluation.

UNIT: IV

Preparation, preservation and equipment for manufacture of meat sausages and their quality evaluation; Abattoir design and layout; Eggs: Structure, composition, quality characteristics, processing, preservation of eggs;

UNIT: V

Processing and preservation of fish meat, poultry meat and chicken patties; Meat plant sanitation and safety; By-products of meat, poultry and eggs and their utilization; Safety standards in meat industry: HACCP/ISO/MFPO/FSSAI/Kosher/Halal.

PRACTICALS

Pre-slaughter operations of fish meat, animals and poultry birds; Slaughtering and dressing of
meat animals; Study of post-mortem changes; Meat cutting and handling; Preservation of meat by freezing; Preservation of meat by curing and pickling; Preservation of meat by

dehydration; Evaluation of quality and grading of eggs; Preservation of shell eggs; Preparation of value added poultry meat products; Value added egg products; Visit to abattoir.

TEXT BOOKS

1. Vikas Nanda. 2014. Meat, Egg and Poultry Science & Technology. I.K. International Publishing House Pvt. Ltd., New Delhi.
2. B.D. Sharma and Kinshuki Sharma. 2011. Outlines of Meat Science and Technology. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.
3. B.D. Sharma. 2003. Modern Abattoir Practices and Animal Byproducts Technology. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. B.D. Sharma. 1999. Meat and Meat Products Technology Including Poultry Products Technology. Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi.
2. Alan H. Varnam and Jane P. Sutherland. 1995. Meat and Meat Products: Technology, Chemistry and Microbiology. Chapman & Hall, London.
3. William J. Stadelman and Owen J. Cotterill. 1995. Egg Science and Technology, 4th Ed. Food Products Press, NY, USA.
4. R.A. Lawrie. 1985. Meat Science, 4th Ed. Pergamon Press, Oxford, UK.