

6.1 FOOD PACKAGING TECHNOLOGY

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RATIONALE

The main objective of this subject is to impart knowledge and skills related to designing packaging system in food products and developing skills in handling of packaging equipment in the students

DETAILED CONTENTS

1. Introduction (2 hrs)
Definition, importance and scope of packaging of foods
2. Packaging Materials (10 hrs)
Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials
3. Types of packaging (8 hrs)
Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, CAP, MAP, aseptic etc.
4. Brief Introduction to (4 hrs)
WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.
5. Packaging Requirements (16 hrs)
Packaging requirements and their selection for raw and processed foods
 - 1.1 Meat, fish, poultry, eggs
 - 1.2 Milk and dairy products
 - 1.3 Fruits and vegetables
 - 1.4 Cereal grains and baked food products
 - 1.5 Beverages
 - 1.6 Snacks
6. Packaging Machinery (6 hrs)
Bottling, can former, form fill and seal machines, bags – their manufacturing and closing, vacuum packs unit, shrink pack unit, tetra pack unit
7. Package labeling – functions and regulations (2 hrs)

LIST OF PRACTICALS

1. Identification of different types of packaging and packaging materials
2. Determination of tensile strength of given material
3. To perform different destructive tests for glass containers
4. To perform non-destructive tests for glass containers
5. Determination of wax weight
6. Determination of tearing strength of paper
7. Measurement of thickness of packaging materials
8. To perform grease-resistance test in plastic pouches
9. Determination of bursting strength of packaging material
10. Determination of water-vapour transmission rate
11. Demonstration of can-seaming operation
12. Testing of chemical resistance of packaging materials
13. Determination of drop test of food package
14. Visit to relevant industries
15. Introducing the students with the latest trends in packaging consulting the web sites and magazines

INSTRUCTIONAL STRATEGY

This being one of the most important subject, teacher should lay emphasis on developing basic understanding of various concepts and principles and procedures involved herein. Suitable tutorial exercises may be designed by the teachers, which require students visit to various industries. Students may also be exposed to various National and international standards. Visits to the relevant industry for demonstrating various operations involved in the food packing technology, is a must. Experts from the industry may be invited to deliver lectures on the latest technology. Knowledge from pollution control and devices

for the same may be provided to the students. Wherever relevant, students may be made aware about safety aspects.

RECOMMENDED BOOKS

1. Handbook of Packaging by Paine and Paine
2. Manual of Analyzing for Fruits and Vegetables Products by S Ranganna

Note: Wherever the necessary equipment is not available the students may demonstrated That topic in relevant industry or in any other institute

6.2 FOOD ANALYSIS AND QUALITY CONTROL

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RATIONALE

In the production of processed foods, one of the important aspects is to assure quality. This subject is introduced in the curriculum to impart knowledge and skills in the students related to various food quality parameters/systems, techniques of food analysis, food laws and standards

DETAILED CONTENTS

1. Introduction (4 hrs)
Concept, objectives and need of quality, quality control and quality assurance
2. Principles and functions of quality control, quality attributes - qualitative, hidden and sensory, plan and methods of quality control (10 hrs)
3. Sampling (6 hrs)
Definition of sampling, purpose, sampling techniques requirements and sampling procedures for liquid, powdered and granular materials
4. Physicochemical and mechanical properties (10 hrs)
Colour, gloss, flavour, consistency, viscosity, texture and their relationship with food quality
5. Sensory quality control (12 hrs)
Definition, objectives, panel selection and their training, subjective and objective methods, interpretation of sensory results in statistical quality control, TQM and TQC, consumer preferences and acceptance
6. Food Laws and Regulations in India (8 hrs)
Objectives, requirements and benefits of food grades and standards (BIS, AGMARK, PFA, FPO, CAC (Codex Alimentarius Commission))
7. General Hygiene and Sanitation in food industry (4 hrs)
8. GMP, HACCP (Hazard analysis and critical control point) and ISO 9000 Series – Objectives and principles (6 hrs)
9. Layout of quality evaluation and control laboratories (4 hrs)

LIST OF PRACTICALS

1. Proximate analysis of marketed food products
2. Detection of adulteration in food products viz. milk, ghee, honey, spices, pulses, oils, sweets etc.
3. Detection of non-permitted food additives in market food samples, sweets and savory products
4. Cut-out analysis of canned food
5. Test of sensory evaluation
 - a) Hedonic scale
 - b) Duo-trio test
 - c) Ranking difference
 - d) Triangle test
6. Detection of basic tastes and their threshold values
7. Consumer acceptability trial
8. Statistical analysis of sensory data
9. Laboratory preparation of food products and their sensory analysis
10. Determination of insecticides residue in given food sample
11. Visits to the quality control laboratories of the food industry, educational institutions and testing centres

INSTRUCTIONAL STRATEGY

This being one of the most important subjects, teacher should lay emphasis on developing basic understanding of various concepts and principles and procedures involved herein. Suitable tutorial exercises may be designed by the teachers, which require students visit to various industries. Students may also be exposed to various National and international standards. Visits to the relevant industry for demonstrating various operations involved in the food evaluation and quality control is a must. Experts from the industry may be invited to deliver lectures on the latest technology. Knowledge from pollution control and devices for the same may be provided to the students. Wherever relevant, students may be made aware about safety aspects.

RECOMMENDED BOOKS

1. Hand Book of Analysis of Fruits and Vegetables by S Ranganna (THM)
2. Food Analysis Theory and Practices by Pomranz and Meloan (AVI)
3. Quality Control for the Food Industry (Vol. I and II) by Kramer and Twigg (AVI)
4. Laboratory Methods of Sensory Evaluation by Larmond
5. Sensory Analysis by Piggot
6. Hand Book of Food Analysis by S.N. Mahindru
7. The Chemical Analysis of Food and Food Products by Jacobs
8. A First Course in Food Analysis by A.K. Sathe
9. Hand Book of Analysis and Quality Control for Fruit & Vegetable Products

6.3 WASTE MANAGEMENT IN FOOD INDUSTRY

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RATIONALE

This subject is aimed at developing an understanding among the students on Management of agro-processing waste, by-product utilization as food/feed and environmental protection.

DETAILED CONTENTS

1. Introduction (4 hrs)
Types of waste and magnitude of waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment
2. Waste Characterization (12 hrs)
Temperature, pH, Oxygen demands (BOD, COD, TOD), 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
3. Environmental protection act and specifications for effluent of different food industries (6 hrs)
4. By-products and Waste utilization (8 hrs)
5. Effluent Treatment (12 hrs)
 - 1.1 Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation
 - 1.2 Secondary treatments: Biological oxidation – trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons
 - 1.3 Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal
6. Assessment, treatment and disposal of solid waste; concept of vermin-composting and biogas generation (6 hrs)

LIST OF PRACTICALS

1. Waste characterization: (a) temperature (b) pH (c) solids content (d) turbidity (e) BOD (f) COD
2. Visit to effluent treatment plant attached with food industry and city
3. To estimate residual chlorine
4. Evaluation effect of lime treatment on waste water in respects of BOD, COD, solids content, phosphate content
5. Visits to various industries using waste and food by-products
6. Visit to Biogas plant and vermin-culture centre

INSTRUCTIONAL STRATEGY

Pollution control and waste utilization are important in food technology. Teacher should design suitable tutorial exercises for the students. Experts may be invited to deliver lectures on various themes. Students may be taken to some effluent treatment plant and industries engaged in requirements-cycling and utilization of wastes. Students may be given sufficient exposure to various national and international standards for quality parameters required for safe disposal of waste.

RECOMMENDED BOOKS

1. Food Processing Work Management by Green and Krammer; CBS Publication
2. Principles of Food Sanitation by Mariett NG; CBS Publication

6.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

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|-----|--|---------|
| (1) | Entrepreneurship | (4 hrs) |
| | 1.1 Concept/Meaning | |
| | 1.2 Need | |
| | 1.3 Competencies/qualities of an entrepreneur | |
| (2) | Entrepreneurial Support System | (6 hrs) |
| | 2.1 District Industry Centres (DICs) | |
| | 2.2 Commercial Banks | |
| | 2.3 State Financial Corporations | |
| | 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC), Khadi Village and Industries Commission (KVIC), other relevant institutions/organizations/NGOs at State level | |
| (3) | Market Survey and Opportunity Identification (Business Planning) | (6 hrs) |
| | 3.1 How to start a small scale industry | |
| | 3.2 Procedures for registration of small scale industry | |
| | 3.3 List of items reserved for exclusive manufacture in small scale industry | |
| | 3.4 Assessment of demand and supply in potential areas of growth | |
| | 3.5 Understanding business opportunity | |
| | 3.6 Considerations in product selection | |
| | 3.7 Data collection for setting up small ventures | |
| (4) | Project Report Preparation | (6 hrs) |
| | 4.1 Preliminary Project Report | |
| | 4.2 Techno-Economic feasibility report | |
| | 4.3 Project Viability | |

- (5) Managerial Aspects of Small Business (8 hrs)
- 5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control)
 - 5.2 Operational Aspects of Production
 - 5.3 Inventory Management
 - 5.4 Basic principles of financial management
 - 5.5 Marketing Techniques
 - 5.6 Personnel Management
 - 5.7 Importance of Communication in business
- (6) Legal Aspects of Small Business (6 hrs)
- 6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
 - 6.2 Factory Act and Payment of Wages Act
- (7) Environmental considerations (6 hrs)
- 7.1 Concept of ecology and environment
 - 7.2 Factors contributing to Air, Water, Noise pollution
 - 7.3 Air, water and noise pollution standards and control
 - 7.4 Personal Protection Equipment (PPEs) for safety at work places
- (8) Miscellaneous (6 hrs)
- 8.1 Human relations and performance in organization
 - 8.2 Industrial Relations and Disputes
 - 8.3 Relations with subordinates, peers and superiors
 - 8.4 Motivation – Incentives, Rewards, Job Satisfaction
 - 8.5 Leadership
 - 8.6 Labour Welfare
 - 8.7 Workers participation in management

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi

4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

6.5 PROJECT WORK

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Towards the end of third year, after completion of course work, the students should be sent to food processing and preservation industries for project work. The objectives of the project work are:

1. To develop understanding of various field activities in which students are going to play a role as food technologists after completing diploma programme
2. To Develop understanding of subject based knowledge given in the class room in the context of its application at work places
3. To gain first hand experience and confidence amongst the students to enable them to use and apply knowledge and skills to solve practical problems in the field
4. Development of special skills and abilities like interpersonal skills communication skills, attitudes and values

For the fulfillment of above objectives, polytechnic(s) offering diploma course in food technology may establish close linkages with 8 – 10 food processing and preservation industries/organizations. The industries/organizations may be contacted by the teachers and students for project oriented and professional training of students during third year. The practical industrial training has to be well planned, structured and supervised by polytechnic teachers clearly specifying complete schedule of the students on day to day basis for whole of their training period. Proforma may be prepared by polytechnics related to the concerned industries to access daily, weekly and monthly progress of the students and the students must be asked to fill these proformas regularly duly signed by them and countersigned by personnel from industry and concerned teacher attached to a particular student. Each teacher is suppose to supervise and guide 4 to 6 students. Following schedule, as a sample, is proposed for the training

Familiarization and Training about Various Food Processing Operations

Students should be familiarized with various materials, principles and operations involved in processing of different types of food used for different purposes

Specific Task

Students should be given specific task related to following:

- Complete flow chart and plant layout for food-processing unit
- Preparation and preservation of food products, including raw material identification, testing and processing

- Hygiene and sanitation for a food processing and preservation unit
- Fault diagnosis and rectification

Problem-Solving Work Site

After undergoing above two phases of vigorous practical project orientation professional training, students may be given practical problems, which are of interest to industry where he/she is taking practical training. The problem should be identified and guided by the personnel from industry in collaboration with teacher and the solutions suggested by the students may be tried

Note: Students are supposed to prepare detailed notes of each of above phases of training and write complete report of the whole of practical industrial training which shall be used for the learning and evaluation purposes

***Assessment Criteria**

Students may be assessed by the external (personnel from industry) and internal (teacher) examiners based on the criteria given in Table 1 below:

Sr. No.	Performance Criteria Items	** Max. Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Punctuality and Regularity	10	10	8	6	4	2
2.	Initiative in Learning/ Working at site	10	10	8	6	4	2
3.	Level/proficiency of practical problems	20	20	16	12	8	4
4.	Ability to solve live practical problems	20	20	16	12	8	4
5.	Sense of Responsibility	10	10	8	6	4	2
6.	Self Expression/ Communication Skills	5	5	4	3	2	1
7.	Interpersonal skills/human Relations	5	5	4	3	2	1
8.	Report Writing Skills	10	10	8	6	4	2
9.	Viva Voce/Presentation	10	10	8	6	4	2
Total		100	100	80	64	40	20

The overall grading of the practical training shall be made as per following:

Range of maximum Marks	Overall Grade
More than 80	Excellent
79 < > 60	Very Good
59 < > 40	Good
39 < > 20	Fair
Less than 20	Poor

In order to qualify for the diploma students must get “overall good” grade failing which the students may be given just one more chance of undergoing project oriented professional training in the same industry before being disqualified from the diploma and declared “not eligible to receive diploma in food technology”. It is also important to note that the students must get more than six “goods or above good” grades, in different performance criteria items, in order to get “Overall Good” grade

- * The criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks and following the criteria
- ** The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners shall use multiple (1 and 2) of marks original to internal (100 marks) and external (200 marks) respectively to evaluate the students and shall further overall grade them excellent, very good, good, fair or poor

RECOMMENDED BOOKS

1. Food Preservation by SK Kulshrestta, Vikas Publishing House, New Delhi
2. Fundamentals of Food and Nutrition by Sumati R. Mudambi & MV Rajagolap,
New Age International Pvt. Ltd. New Delhi
3. Food Processing and Preservation by Bibliography Sivasankar, Prentice Hall of
India Pvt. Ltd., New Delhi

4. Managing Food Processing Industries in India by U.K. Srivastva
5. Hand Book of Entrepreneurship by B.S. Rathore
6. Microbiological Safety of Processed Foods by Crowther
7. Food Poisoning & Food Hygiene by Hobbs
8. Drying & Storage of Grains & Oilseeds by Brodoker
9. Fundamentals of Food Process Engg. By Toledo
10. Chocolate, Cocoa & Confectionery by Minifie
11. Safe Food Handling by M. Jacob
12. Food & Beverage Service by Andrews
13. The Science of Cookie & Cracker Production by Faridi
14. Snack Food by Booth
15. Food Additives by Mahindru
16. Dough Rheology & Baked Product Texture by Faridi