

5.1 COMPUTER APPLICATIONS IN FOOD TECHNOLOGY

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RATIONALE

The main objective of introducing this subject in the diploma course of food technology is to expose the student with fundamental knowledge on hardware and software of computers. It will also impart knowledge related to the applications of computation in food industries

DETAILED CONTENTS

1. Introduction (8 hrs)
Introduction to various software for their application in food technology
2. Application of MS Excel to solve the problems of Food Technology (20 hrs)
 - a) Chemical kinetics in food processing:
 - Determining rate constant of zero order reaction
 - First order rate constant and half life of reactions
 - Determining energy of activation of vitamin degradation during food storage
 - Rates of Enzymes catalyzed reaction
 - b) Microbial distraction in thermal processing of food
 - Determining decimal reduction time from microbial survival data
 - Thermal resistance factor, Z-values in thermal processing of food
 - Sampling to ensure that a lot is not contaminated with more than a given percentage
 - c) Statistical quality control
 - Probability of occurrence in normal distribution
 - Using binomial distribution to determine probability of occurrence
 - Probability of defective items in a sample obtained from large lot
 - d) Sensory evaluation of food
 - Statistical descriptors of a population estimated from sensory data obtained from a sample
 - Analysis of variance
 - * One factor, completely randomized design
 - * For two factor design without replication
 - Use of linear regression in analyzing sensory data
 - e) Mechanical transport of liquid food
 - Measuring viscosity of liquid food using a capillary tube viscometer

- f) Solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel
3. Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product (10 hrs)
4. Basic Introduction to computer aided manufacturing (10 hrs)
Application of computers in instrumentation and control of food machinery, inventory control, process control etc.

LIST OF PRACTICALS

1. Introduction to computer
2. Operating system practice using DOS commands
3. Problem solving using spread sheet
4. Use of statistical package for analysis of data
5. Use of word processing software for creating reports
6. Familiarization with software related to food industry
7. Visit to the industries & knowledge of computer application in same

INSTRUCTIONAL STRATEGY

This is a practical oriented subject. Teacher should lay emphasis on giving hand on practice on computers to the students. Latest software in food technology may be procured and students should be given demonstration and practice on the same. The relevant theory may be given along with practical exercises. Some of the experts from industries may be invited to deliver lectures and demonstration.

RECOMMENDED BOOKS

1. Computer Applications in Food Technology : Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office

5.2 FOOD ADDITIVES

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RATIONALE

Flavour, colour and food additives are important aspects of food processing from consumer acceptability point of view. At the same time, addition of flavour and colour can be harmful from medical point of view. Standards have been laid down for type and concentration of food additives. The students should be exposed to various aspects of food additives. Hence this subject is being included in the curriculum

DETAILED CONTENTS

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|----|--|----------|
| 1. | Food additives – definition and importance | (4 hrs) |
| 2. | Classification, functions and uses of food additives: | (36 hrs) |
| | - Preservatives | |
| | - Antioxidants | |
| | - Mould Inhibitors | |
| | - Emulsifiers | |
| | - Acids, bases, salts and buffering agents | |
| | - Anti-caking agents | |
| | - Flour maturing and bleaching agents | |
| | - Colourants | |
| | - Flavouring agents | |
| | - Texture modifiers, stabilizers, thickeners | |
| | - Humectants | |
| | - Leavening agents | |
| | - Low and non-calorie sweetening agents | |
| | - Fat replacers | |
| 3. | Stability of food additives during processing | (4 hrs) |
| 4. | Legal standards and permissible limits of food additives | (4 hrs) |

LIST OF PRACTICALS

1. Detection of antioxidants in foods
2. Detection of benzoic acid in foods
3. Estimation of potassium bromate
4. Detection of pectin grade

5. Detection of saccharin in beverages
6. To study the effect of baking soda on CO₂ production
7. Determination of nitrates in meat products
8. To study the effect of antioxidants on stability of oils
9. To study the effect of oscillator sodium alginate on texture of ice-cream
10. To study the effect of different levels of sorbic acid on mold growth of cheese
11. To study effect of using calcium propionate on keeping quality of bread
12. To study the effect of using different levels of pectin on preparation of jelly
13. To study the effect of using anti-caking agents on salt.

INSTRUCTIONAL STRATEGY

Experts from the industry may be invited to deliver lectures on various relevant themes. Students may be taken to industry to demonstrate addition of food additives. Students would be given thorough understanding about national and international standards related to food additives.

RECOMMENDED BOOKS

1. Manual of Analysis for Fruits and Vegetables by Ranganna
2. Food Additives, CRC Press
3. Spices and Seasoning- A Food technology handbook by Tanter and Qrenis-VCH Publisher
4. Spices Condimentsand Seasoning-K.T. Forrett-AVI
5. Spices Vol-I and II by J.W. Purseglove - longman Publisher

Note: Wherever required equipment's are not available necessary demonstration can be Relevant industry or in any other Institution

5.3 HEALTH AND FUNCTIONAL FOODS

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RATIONALE

Health and functional foods are comparatively new concepts in the food industry. Some of the students may find employment in the industries engaged in processing of health and functional food. Understanding of different aspects related to health and function foods is essential to these diploma holders. Hence this subject is included in the curriculum

DETAILED CONTENTS

1. Introduction – definition, status and scope of health and functional foods in India (2 hrs)
2. Definition of nutraceuticals and their importance (5 hrs)
3. Types of health and functional foods and their properties (5 hrs)
4. Various food constituents responsible for functional effects (10 hrs)
 - Anti-carcinogenic, hypocholesterolemic and hypoglycemic foods
 - Dietetic foods
 - Fortified foods
 - Biofedic and probiotic foods
5. Processing of health and functional foods, criteria for selection of raw materials, and their processing (6 hrs)
6. Storage, packaging and labeling of health and functional food (4 hrs)
7. Marketing aspects of health and functional foods (4 hrs)
8. Legal aspects of health and functional foods (4 hrs)
9. Export potential of health and functional foods (4 hrs)
10. Organic foods and Genetically Modified (GM) foods in relation to health (4 hrs)

LIST OF PRACTICALS

1. Preparation of high fibre bread
2. Preparation of high fibre biscuits
3. Preparation of high fibre cake
4. Preparation of nutritious beverages
5. Preparation of functional foods for obese persons
6. Preparation of functional foods for aged persons
7. Preparation of hypocholesterolemic foods
8. Preparation of diets for anaemic patients
9. Preparation of low sodium foods
10. Preparation of malt based drink
11. Preparation of foods for under-weight persons
12. Preparation of high caloric diet for sportsmen
13. Preparation of high protein diet for sportsmen
14. Preparation of fortified atta

INSTRUCTIONAL STRATEGY

Experts from the industry may be invited to deliver lectures on various relevant themes. Students may be taken to industry to demonstrate processing of health and functional foods. Students should be given a thorough understanding about national, BIS and international standards related to health and functional foods.

RECOMMENDED BOOKS

Browsing of Web-sites for relevant material on internet.

5.4 INSTRUMENTATION AND PROCESS CONTROL

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RATIONALE

After studying the course the students will be able to identify different types of sensors and transducers and their applications in the field of instrumentation and process control used in food industry. The students will be able to select appropriate transducers relating to a process and will also get the relevant technical know how about the conditioning of a signal from a transducer for the purpose of control. This course will also enable the students to study in detail different types of control systems used in instrumentation and will provide understanding of basic control loops

DETAILED CONTENTS

1. Basic Building Blocks of any Instrumentation Systems (2 hrs)
 - Scope and necessity of instrumentation
 - Names of important process variables, their units
 - Building blocks of instrumentation system
 - Various testing signal
2. Basic Concepts (4 hrs)
 - Definition of the terms accuracy, precision sensitivity, linearity, hysteresis gauge factor etc
3. Variable Resistance Transducers (5 hrs)
 - Construction, working, principle and applications of potentiometers, strain gauge, load cell
 - Hot wire anemometers, photo resistors, humidity sensor
 - Resistive temperature transducers
 - Thermistors
4. Variable Inductance Transducers (5 hrs)
 - 4.1 Basic principles
 - 4.2 Electromagnetic pick up
 - 4.3 Induction potentiometer
 - 4.4 Linear variable differential transformer (LVDT)
 - 4.5 Variable reluctance transducers

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| 5. | Flow Measurements | (4 hrs) |
| | Flow measurement with orifice, magnetic, ultrasonic, vortex flow meters | |
| 6. | Level Measurements | (6 hrs) |
| | Level detectors, float level devices, level gauges, optical level devices, radiation level sensors, thermal level sensors | |
| 7. | Temperature Measurement | (6 hrs) |
| | Temperature sensors – thermocouples, RTDs, thermistors, radiation thermometry, IR detectors, fibre-optic temperature sensor; acoustic phrometer | |
| 8. | Pressure Measurement | (6hrs) |
| | Pressure sensors, bellows, diaphragm, bourdon and helical types, electronic pressure sensor, manometers, pressure gauges, vacuum sensors, high-pressure sensors, pressure repeaters | |
| 9. | Measurement systems for density humidity, dry bulb temperature, wet bulb temperature, Degree brix, specific gravity | (4 hrs) |
| 10. | Instrumentation and Safety | (6 hrs) |
| | Alarm and shutdown devices, safety interlock systems; Computer control system – introduction to SDC and DDC and their applications in process industries | |

INSTRUCTIONAL STRATEGY

The students may be taken to some of the hi-tech food preservation and processing industries, which are using advanced instrumentation and process control for various operations.

RECOMMENDED BOOKS

1. Mechanical and Industrial Measurement by RK Jain; Khanna Publishers New Delhi
2. Industrial Instrumentation by Donald P Eickman
3. Electrical and Electronic Measurements and Instrumentation by AK Sawhney, Dhanpat Rai and Company
4. Control System Engineering by Nagrah, IJ and Gopal, M: Willey Eastern Ltd., New Delhi

5. automatic Control System by Kuo, BC; Prentice Hall of India, New Delhi
6. Modern Control Engineering by Ogata K; Prentice Hall of India, New Delhi
7. Theory and Problems of Feedback Control System by Sachaam Series; Schajit Publishing Co., New York
8. Feedback Control System by Bakshi, UA and Goyal SC; Technical Publications, Pune
9. Process Control Instrumentation by Curtis D Johnson; John Wiley and Sons
10. Process Measurement and Analysis by Bela G Liptaic Bittenworth Heinemann
11. Practical Process Instrumentation and Control; McGraw Hill, New York
12. Instrumentation in Process Control by Wightman EJ; Bittenworth (London)
13. Handbook of Controls and Instrumentation by Lenk John D; Prentice Hall Inc.
14. Process/Industrial Instruments and Control Handbook by Considinek Douglas V, McGraw Hill
15. Process Control by Harrist P; McGraw Hill
16. Automatic Process Control by Eckman DP; Wiley Eastern, 1975
17. Instrument Engineers Handbook by Liptak BG 3rd Edition
18. Process Control Instrumentation Technology by Johnson Curtis D; John Wiley and Sons
19. Principles of Industrial Process Control by Eckman, Donal P; John Wiley and Sons
20. Process Measurement and Analysis, Third Edition by Liptak Bila G

5.5 TECHNOLOGY OF OILS & FATS

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RATIONALE

This subject is aimed at imparting thorough knowledge and skill related to the extraction and processing techniques of oils & fats and their nutritional and qualitative effects on food

1. Introduction (6 hrs)
Oils and Fats, sources and composition, physico-chemical properties of oil & fats
2. Nutritional importance of oils and fats (2 hrs)
3. Function of oil and fats in food (4 hrs)
 - Tenderness
 - Texture
 - Flavor
 - Emulsion
4. Processing of oil and fats (4 hrs)
Pretreatment, rendering, pressing, extraction methods, refining, bleaching, hydrogenation, fractionation, deodorizing, plasticizing, packaging
5. Production and processing of Animal fats (12 hrs)
 - Butter
 - Margarine
 - Lard
 - Fishoil
6. Production and processing of vegetable oils (12 hrs)
 - Soyabean oil
 - Mustard oil
 - Groundnut oil
 - Sunflower oil

PRACTICALS

1. To determine the smoke point, flash point and fire point of given sample
2. To determine the acid value of given sample
3. To determine the iodine value of given sample

4. To determine the saponification value of given sample
5. Determination of rancidity of given sample
6. To determine the melting point of given sample
7. To determine the free content of a given sample by apparatus
8. Visit to oil processing industry

RECOMMENDED BOOKS

1. Food Science: Norman. N. Pottov CBS Publication
2. Food Oils & Fats: Lawson Harry-CBS Publication
3. Food Oils & Fats: Bailey Publication
4. Food Oils & Fats by Lawson
5. Bailey's Industrial Oil and Fat Products by Daniel Swern
6. The Chemical Analysis of Food and Food Products by Jacobs
7. A First Course in Food Analysis by A.K. Sathe
8. Standards for Fats & Oils by Lawson

5.6 PROJECT ORIENTED PROFESSIONAL TRAINING

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Towards the end of second year, after completion of course work, the students should be sent to food processing and preservation industries for project oriented professional training. The purpose of this training is:

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
 1. 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
 2. 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 Foodby Booth
15. Food Additives by Mahindru
16. Dough Rheology & Baked Product Texture by Faridi