5.1 EMPLOYABILITY SKILLS – I

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Writing skills (08 hrs)

   i) Official and business correspondence
   ii) Job application - covering letter and resume
   iii) Report writing - key features and kinds

2. Oral Communication Skills (20 hrs)

   i) Giving advice
   ii) Making comparisons
   iii) Agreeing and disagreeing
   iv) Taking turns in conversation
   v) Fixing and cancelling appointments

3. Generic Skills (04 hrs)

   i) Stress management
   ii) Time management
   iii) Negotiations and conflict resolution
   iv) Team work and leadership qualities

5.2 ENVIRONMENTAL EDUCATION

L	T	P
3	-	-

RATIONALE

Education about environment protection is a must for all the citizens. In addition, a diploma holder must have knowledge of different types of pollution caused by industries and construction activities so that he may help in balancing the eco system and controlling pollution by adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Definition, Scope and Importance of Environmental Education (02 hrs)

2. Basics of ecology, biodiversity, eco system and sustainable development (03 hrs)

3. Sources of pollution - natural and manmade, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement (12 hrs)

4. Solid waste management – Causes, effects and control measures of urban and industrial waste (06 hrs)

5. Mining and deforestation – Causes, effects and control measures (04 hrs)

6. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (10 hrs)

7. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) (04 hrs)

8. Current Issues in Environmental Pollution – Global Warming, Green House Effect, Depletion of Ozone Layer, Recycling of Material, Environmental Ethics, Rain Water Harvesting, Maintenance of Groundwater, Acid Rain, Carbon Credits. (07 hrs)

INSTRUCTIONAL STRATEGY

The contents will be covered through lecture cum discussion sessions. In addition, in order to have more appreciation of need for protection of environment, it is suggested that

different activities pertaining to Environmental Education like video films, seminars, environmental awareness camps and expert lectures may also be organized.

RECOMMENDED BOOKS

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.
3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
Total	**48**	**100**

5.3 COMPUTER APPLICATIONS IN FOOD TECHNOLOGY

L	T	P
-	-	5

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. The relevant theory instructions may be imparted along with practical exercises.

DETAILED CONTENTS

1. Introduction
   - 1.1. Introduction to computer and related hardware used in food industry (Touch Screens, Hand Held Devices, Palm Tops, Barcode Printers and Scanners, RFID Tags, etc.)
   - 1.2. Introduction to various softwares for their application in food technology (like SAP, justFoodERP, FoodWorks, SERVE, etc.) with relevant case studies.
   - 1.3 Application of MS Excel (latest version) to solve the problems of Food Technology
   - 1.4 MS Excel Basics
     - Introduction to different menus and commands commonly used in solving problems.
     - Use of Add-In Tools like MegaStat, etc. for statistical data analysis.

2. Application of MS Excel to solve the problems of Food Technology
   - 2.1 Chemical kinetics in food processing
     - Determining rate constant of zero order reaction
     - First order rate constant and half-life of reactions
   - 2.2 Microbial destruction in thermal processing of foods
     - Determining decimal reduction time from microbial survival data
   - 2.3 Statistical quality control in food processing
     - Control Charts

2.4 Sensory evaluation of foods

- Statistical descriptors of a population estimated from sensory data obtained for a sample

2.5 Mechanical transport of liquid foods

- Measuring viscosity of liquid foods using a capillary tube viscometer

2.6 Steady state heat transfer in food processing

- Reducing heat transfer through a wall using insulation

2.7 Transient heat transfer in food processing

- Predicting temperature in a liquid food heated in a steam-jacketed kettle

2.8 Refrigeration, freezing and cold chain

- Pressure-temperature relations for ammonia used as a refrigerant in a vapor compression refrigeration system
- Loss of quality in the cold chain

3. Familiarization with the application of computer in some common food industries, (like milk plant, bakery, fruit and vegetable processing, etc.) starting from the receiving of raw material up to the storage and dispatch of finished product with relevant case studies.

4. Basic Introduction to CAD (Computer Aided Designing), CAM (Computer Aided Manufacturing), CIM (Computer Integrated Manufacturing) and CAE (Computer Aided/ Assisted Engineering) and application of different softwares (like AutoCAD, Pro-E, Google Sketchup, etc.) in the same.

5. Basic Introduction to Application of computers in instrumentation and process control of food industry (PLC, SCADA, etc.), Inventory control and management in food industry using computers.

6. Sensory analysis using sensory analysis softwares (like Compusense 5, SIMS 2000, etc.).

7. Use of statistical packages (MS Excel, MegaStat Excel Add-In (Free Add-In), Graphpad InStat, Graphpad StatMate, Statistica, SPSS, Matlab, etc.) for analysis of data.

8. Use of search engines and online research databases for research on food related topics.
9. Use of word processing software (like MS Word) for creating reports and technical papers with the help of reference managers (like EndNote, Reference Manager, RefWorks, etc.)
10. Working with chemical and biological structures drawing softwares (like ChemBioOffice, ChemDraw, etc.)
11. Familiarization with software related to food industry (like SAP, justFoodERP, LIMS (Laboratory Management Information System), etc.
12. Use of simulation softwares for food industry related problems (like FlexSim, MATLAB Simulink, etc.)
13. Visit to the industries & knowledge of computer application in the same.

INSTRUCTIONAL STRATEGY

This is a practical oriented subject. Teacher should lay emphasis on giving hands 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. Computer Applications in Food Technology by Vedpal Yadav, i-proclaim.com.
3. Statistical Quality Control for the Food Industry by Merton R. Hubbard (Kluwer Academic)
4. MS Excel Video Tutorials on http://www.youtube.com (Recommended channel is ExcelIsFun).
5. MS Excel for Dummies.
6. Manuals of MS office

5.4 HEALTH AND FUNCTIONAL FOODS

L	T	P
3	-	2

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 types and importance of nutraceuticals (5 hrs)

3. Types of health and functional foods and their properties (5 hrs)

4. Various food constituents responsible for functional effects (20 hrs)

   - Anti-carcinogenic, hypocholesterolemic and hypoglycemic foods
   - Anti-oxidants
   - Fortified and enriched foods
   - Biofedic, probiotic foods, prebiotics and symbiotic
   - High protein and high and low energy foods
   - Artificial sweetners
   - Geriatric foods

5. Importance fibre in health and prevention of diseases (6 hrs)

6. Fortification and enrichment, definition and importance, fortified foods-salts, atta and oil, enriched-juices and health drinks (5 hrs)

7. Organic and genetically modified foods (GM) in relation to health (5 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

1. Geissler (2005) powers; Human Nutrition
2. Krause food, Nutrition and diet therapy (latest edition)

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	05	10
3	05	10
4	20	44
5	06	12
6	05	10
7	05	10
Total	**48**	**100**

5.5 INSTRUMENTATION AND PROCESS CONTROL

L	T	P
3	-	-

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

The objective of this course is to give the knowledge of various instruments and skill in handling them, which control the process parameters and various operations in any food industry

DETAILED CONTENTS

1. Introduction (8 hrs)

   Importance of instruments in process industries. Classification of instruments, static and dynamic characteristics of instrument.

2. Instruments for Temperature Measurement (6 hrs)

   Thermometer , thermocouple, thermister and pyrometer, application and working.

3. Instruments for pressure Measurement (8 hrs)

   Use of Manometers, Bourdon gauge, measurement of vacuum and pressure. Liquid level measurement-Direct and differential method.

4. Flow Measurements (8 hrs)

   Flow measurement and calibration with orifice, venturi meter, rotameter, pitot tube

5. Instruments for Miscellaneous Measurements (10 hrs)

   Measurement of viscosity, conductivity, humidity and pH value, TSS, industrial weighing systems.

6. Controls (8 hrs)

   Concept of automatic process control and its classifications. Types of controllers and their applications.

INSTRUCTIONAL STRATEGY

As far as possible the teachers should demonstrate various instruments used in food processing during the lectures. Expert's lectures and field visits may also be allowed to supplement the classroom instruction.

RECOMMENDED BOOKS

1. Process Control by Harriott and Peter Process system Analysis and Control of Coughanour; McGraw Hill

2. Industrial Instrumentation by Eckman; Wiley Eastern

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	18
2	06	12
3	08	16
4	08	16
5	10	22
6	08	16
Total	**48**	**100**

5.6 TECHNOLOGY OF OILS & FATS

L	T	P
3	-	2

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 (12 hrs)
   Oils and Fats, sources, composition their, physico-chemical properties

2. Nutritional importance of oils and fats (02 hrs)

3. Functions of oils and fats in food (02 hrs)
   - Tenderness
   - Texture
   - Flavor
   - Emulsion

4. Processing of oil and fats (06 hrs)

   Pretreatment; extraction method; rendering; pressing; solvent extraction; refining; bleaching; hydrogenation; winterization; degumming; fractionation; deodorizing; plasticizing; packaging

5. Production and processing of animal fats (10 hrs)
   - Margarine
   - Lard
   - Fish oil

6. Production and processing of vegetable oils (14 hrs)
   - Soya bean oil
   - Mustard oil
   - Groundnut oil
   - Sunflower oil
   - Olive oil, palm oil, coconut oil

7. Blending and nutritional enrichment of oils. (02 hrs)

PRACTICALS

1. To determine the smoke point, flesh 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 a sponification value of given sample

5. Determination of rancidity of given sample
6. To determine the melting point of given sample
7. To determine the fat content of a given sample by soxhlet apparatus
8. Visit to oil processing industry
9. Detection of adulteration in fats/oils

RECOMMENDED BOOKS

1. Food Science: Norman. N. Potter CBS Publication, *CBS* Publishers and distributors Pvt. Ltd, New Delhi
2. Food Oils & Fats: Lawson Harry-CBS Publication, *CBS* Publishers and distributors Pvt. Ltd, New Delhi
3. Food Oils & Fats: Bailey Publication, Oxford & IBH *Publishing* Co., New Delhi
4. Bailey's Industrial Oil and Fat Products by Daniel Swern, Interscience *Publishers*, New York
5. The Chemical Analysis of Food and Food Products by Jacobs, Morris B *Jacobs Publisher*: New York,
6. A First Course in Food Analysis by A.K. Sathe, New Age Publications, New Delhi
7. Standards for Fats & Oils by Lawson, AVI *Publishing* Company, Westport.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	24
2	02	06
3	02	06
4	06	12
5	10	20
6	14	28
7	02	04
Total	**48**	**100**

5.7 PROJECT ORIENTED PROFESSIONAL TRAINING - I

L	T	P
-	-	12

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

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	

Norms as prescribed by Board may be followed.

* 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 (100 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, Oxford & IBH *Publishing* Co., New Delhi
6. Microbiological Safety of Processed Foods by Crowther, Vikas *Publishing* House, New Delhi.
7. Food Poisoning & Food Hygiene by Hobbs
8. Drying & Storage of Grains & Oilseeds by Brodoker

9. Fundamentals of Food Process Engg. By Toledo, AVI *Publishing* Co., Westport

10. Chocolate, Cocoa & Confectionery by Minifie, AVI *Publishing* Co., Westport

11. Safe Food Handling by M. Jacob, Hemisphere *Publishing* Corporation, New York

12. Food & Beverage Service by Andrews, Heinemann Educational *Books* Ltd., London.

13. The Science of Cookie & Cracker Production by Faridi, CBS *Publishers* & Distributors, New Delhi

14. Snack Foodby Booth, *Publishers* ISBN, New Delhi

15. Food Additives by Mahindru, **.** A.P.H. *Publishers, New Delhi*

16. Dough Rheology & Baked Product Texture by Faridi, CBS *Publishers* & Distributor, New Delhi

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview' Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene