6.1 EMPLOYABILITY SKILLS – II

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 to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Oral Practice

i)	Mock interview	(05 hrs)
ii)	Preparing for meeting	(05 hrs)
iii)	Group discussion	(05 hrs)
iv)	Seminar presentation	(05 hrs)
v)	Making a presentation	(12 hrs)

a) Elements of good presentation
b) Structure and tools of presentation
c) Paper reading
d) Power point presentation

6.2 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (14 hrs)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms of business organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

2. Market Survey and Opportunity Identification (10 hrs)

- Scanning of business environment
- Salient features of National and State industrial policies and resultant business opportunities
- Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection

3. Project report Preparation (08 hrs)

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report

SECTION –B MANAGEMENT

4. Introduction to Management (04 hrs)

- Definitions and importance of management
- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations
    a) Line organisation
    b) Line and staff organisation
    c) Functional Organisation

5. Leadership and Motivation (03 hrs)

a) Leadership
    - Definition and Need
    - Qualities and functions of a leader
    - Manager Vs leader
    - Types of leadership

b) Motivation

- Definitions and characteristics
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas (06 hrs)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics (03 hrs)

a) Customer Relation Management (CRM)

- Definition and need
- Types of CRM

b) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)

- Introductions, definition and its importance
- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	28
2	10	20
3	08	16
4	04	10
5	03	06
6	06	14
7	03	06
Total	**48**	**100**

6.3 FOOD PACKAGING TECHNOLOGY

L	T	P
2	–	2

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 (02 hrs)

   Definition, importance and scope of packaging of foods

2. Packaging Materials (06 hrs)

   Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials

3. Types of packaging (06 hrs)

   Vacuum packaging, gas packaging, MAP, CAP, active packaging, aseptic packaging, edible packaging, shrink packaging

4. Brief Introduction to (04 hrs)

   WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.

5. Packaging Requirements (08 hrs)

   Packaging requirements and their selection for raw and processed foods
   - 5.1 Meat, fish, poultry, eggs
   - 5.2 Milk and dairy products
   - 5.3 Fruits and vegetables
   - 5.4 Cereal grains and baked food products
   - 5.5 Beverages
   - 5.6 Snacks

6. Packaging Machinery (04 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 (02 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 such as physical examination
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 for paper
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 magzines

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; Morgan-Grampian *Publishing* Co., New York (1976).

2. Manual of Analyzing for Fruits and Vegetables Products by S Ranganna; CBS *Publishers* & Disttributor, New Delhi.

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	06	18
3	06	20
4	04	16
5	08	20
6	04	14
7	02	08
Total	**32**	**100**

s

6.4 TECHNOLOGY OF NON-ALCOHOLIC BEVERAGES

L	T	P
2	–	2

RATIONALE

Non-alcoholic industries are one of the fast growing industries in India. Therefore, this subject is introduced with the basic objective to impart knowledge and skills of process techniques and equipment used for the production of these beverages, to the students.

DETAILED CONTENTS

1. Introduction (02 hrs)
   Definition, scope and status of beverage industry in India

2. Water: Sources, quality, treatment (02 hrs)

3. Ingredients of food beverages; sweeteners, emulsitifiers, coloring agents, flavoring agents, stablizers, water and their quality (08 hrs)

4. Mineral water and its specifications and standards (04 hrs)

5. Carbonated Beverages (06 hrs)
   Equipment and machinery for carbonated beverages, water treatment, syrup preparation, containers and closures. Cleaning, carbonation, filling, inspection and quality control

6. Non-carbonated beverages (06 hrs)
   Technology, specification, equipment and machinery for instant and normal tea and coffee, fruit juice based beverages, synthetic beverages

7. Sanitation and hygiene in beverage industry (04 hrs)

LIST OF PRACTICALS

1. Preparation of carbonated beverages and their evaluation

2. Preparation of instant coffee

3. Preparation of tea

4. Preparation of Ready To Serve beverages (RTS beverages)

5. Preparation of squash

6. Determination of water quality parameters; hardness, pH, turbidity, E-coli Test, DO, BOD, COD

7. Preparation of flavoured milk

8. Analysis of a spurious liquor sample

9. Determination of CO_2 level carbonated beverages

10. Visit to carbonated and non-carbonated beverage industry

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 beverage, 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. Technology of Carbonated Beverage AVI Publications

2. Formulation and Production of Carbonated Soft Drinks by AJ Mitchel (Blackie Publishers)

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	08
2	02	08
3	08	24
4	04	12
5	06	18
6	06	18
7	04	12
Total	**32**	**100**

6.5 FOOD ANALYSIS AND QUALITY CONTROL

L	T	P
3	–	2

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 (12 hrs)

    1.1. Principle behind different methods of proximate analysis of

        1.1.1. Moisture
        1.1.2. Ash
        1.1.3. Crude Fat
        1.1.4. Crude Protein
        1.1.5. Crude Fibre
        1.1.6. Total Carbohydrates

    1.2. Concept, objectives and need of

        1.2.1. quality,
        1.2.2. quality control and
        1.2.3. quality assurance
        1.2.4. TQM (Total Quality Management) and
        1.2.5. TQC (Total Quality Control),
        1.2.6. plan and methods of quality control

2. Sampling (04 hrs)

    2.1. Definition of sampling,
    2.2. purpose,
    2.3. sampling techniques requirements and
    2.4. sampling procedures for
        2.4.1. liquid,
        2.4.2. powdered and
        2.4.3. granular materials

3. Physicochemical and mechanical properties (08 hrs)
    3.1. Colour,
    3.2. gloss,
    3.3. flavour,
    3.4. consistency,
    3.5. viscosity,
    3.6. texture and their relationship with food quality

4. Sensory quality control (10 hrs)

   4.1. Definition,
   4.2. objectives,
   4.3. panel selection and their training,
   4.4. subjective and objective methods,
   4.5. interpretation of sensory results in statistical quality control,
   4.6. consumer preferences and acceptance

5. Food Laws and Regulations in India (06 hrs)

   Agencies and standards :
   - BIS (Bureau of Indian Standards),
   - AGMARK (Agricultural Marketing Board),
   - PFA (Prevention of Food Adulteration Act),
   - FSSA (Food Safety and Standards Act),
   - FPO (Fruit Products Order),
   - MoFPI (Ministry of Food Processing Industries)
   - ISO (International Organisation for Standardisation)- Objectives and principles
   - CAC (Codex Alimantarious Commission)

6. General Hygiene and Sanitation in food industry (06 hrs)

   Concepts of:
   6.1. GMP (Good Manufacturing Practices),
   6.2. GHP (Good Hygienic Practices),
   6.3. GLP (Good Laboratory Practices)
   6.4. HACCP (Hazard analysis and critical control point)

7. Layout of quality evaluation and control laboratories (02hrs)

LIST OF PRACTICALS

1. Proximate analysis of marketed food products
   1.1. Moisture
   1.2. Ash
   1.3. Crude Fat
   1.4. Crude Protein
   1.5. Crude Fibre
   1.6. Total Carbohydrates

2. Detection of basic tastes and their threshold values
3. Consumer acceptability trial
4. Statistical analysis of sensory data
5. 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.

LIST OF RECOMMENDED BOOKS

1. Food Analysis by Suzzane Nielsen
2. ISI Handbook of Food Analysis- (18 Volumes in 5 parts)- BIS
3. AOAC- 18th Edition- (CD ROM Edition)
4. Hand Book of Analysis of Fruits and Vegetables by S Ranganna (THM)
5. Food Analysis Theory and Practices by Pomeranz and Meloan (AVI)
6. Quality Control for the Food Industry (Vol. I and II) by Kramer and Twigg (AVI)
7. Laboratory Methods of Sensory Evaluation by Larmond
8. Sensory Analysis by Piggot
9. Hand Book of Food Analysis by S.N. Mahindru
10. The Chemical Analysis of Food and Food Products by Jacobs
11. A First Course in Food Analysis by A.K. Sathe

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	24
2	04	08
3	08	16
4	10	20
5	06	14
6	06	14
7	02	04
Total	**48**	**100**

6.6 WASTE MANAGEMENT IN FOOD INDUSTRY

L	T	P
3	–	2

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 (04 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 (06 hrs)

4. By-products and Waste utilization (08 hrs)

5. Effluent Treatment (12 hrs)

   5.1 Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation

   5.2 Secondary treatments: Biological oxidation – trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons

   5.3 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 (06 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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	12	24
3	06	12
4	08	16
5	12	26
6	06	14
Total	**48**	**100**

6.7 PROJECT ORIENTED PROFESSIONAL TRAINING - II

L	T	P
-	-	12

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

Norms as practiced by the 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
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