CURRICULLUM OF 3RD SEMESTER

For

DIPLOMA IN FOOD TECHNOLOGY

(Effective FROM 2019-20 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

SALIENT FEATURES OF THE DIPLOMA PROGRAMME IN FOOD TECHNOLOGY

1. Name of the Program : Diploma In FOOD TECHNOLOGY
2. Duration of the Program : Three Years
3. Entry Qualifications : Matriculation or equivalent as prescribed by AICTE.
4 Pattern of the Program : Semester Pattern

JOB OPPORTUNITIES

Employment opportunities for diploma holder in FOOD TECHNOLOGY are visualized in following industries at various levels/positions:

(i) Food technology and Allied Industries like

(a) Sea food industry
(b) Research Laboratory
(c) Dairy
(d) Breweries
(e) Mineral water industry
(f) Food Processing industry
(g) Beverages
(h) Agro industry
(i) Distilleries
(j) Bakery Industry
(k) Meat Food Industry
(l) Dietitian
(m) Food inspector

In various functional areas like erection and commissioning of plant, plant operation, production, maintenance and safety, quality control, inspection and testing, marketing and sales, consultancy services and areas concerning environmental protection.

(ii) Research Organizations like CSIR laboratories, Defense laboratories, CFTRI etc.

(iii) Entrepreneurs to small/tiny units especially food, agro and sea food industries.

3. COURSE OBJECTIVES

Keeping in view the employment opportunities of diploma holders in Food technology, the course is aimed at developing following knowledge and skills in the students:

1. Basic understanding of concepts and principles related to applied sciences as a foundation for further studies.

2. Development of communication and interpersonal skills for effective functioning in the world of work.
3. Understanding of basic concepts and principles of mechanical, electrical and civil engineering so as to enable the students to apply the knowledge of these principles to the field of Biotech engineering.
4. Ability to read and interpret drawings related to plant layout, process equipment and components.
5. Knowledge of various materials used in Biochemical processes, their properties and specifications.
6. Knowledge and associated skills of various unit operations, unit processes and process instrumentation in process industry.
7. Ability to calculate the quantity of raw materials, energy inputs, manpower requirement and output from the process.
8. Ability to control the process and quality of the products commiserating with laid specifications.
9. Understanding of basic principles of managing men, material and machines/ equipment for optimum production.
10. Appreciation of the need of clean environment and its deterioration by various emissions from industry and preventive procedures and knowledge of safety regulations in process industry.
11. Development of generic skills of thinking and problem-solving, communication, attitudes and value system for effective functioning in a process industry.
12. Proficiency in the use of computers.
13. Basic manual and machining skills as an aid to function effectively in the process industry.
14. Knowledge of testing and quality control activities.
15. Detailed knowledge of Biotechnology and Biochemical products along with processes involved in their production.
16. Detailed knowledge of fertilizers and technology involved in their production along with important Biotechnology plants in India.
17. Development of good personality in order to have effective communication and business ethics.

DERIVING CURRICULUM AREAS FROM COURSE OBJECTIVES

The following curriculum areas have been derived from course objectives.

Sr. No.	Curriculum Objectives	Curriculum Areas/Subjects
1.	Basic understanding of concepts and principles related to applied sciences as a foundation for further studies.	- Applied Physics - Applied Chemistry - Applied Mathematics
2.	Development of communication and interpersonal skills for effective functioning in the world of work.	- Communication Skills
3.	Understanding of basic concepts and principles of mechanical, electrical and civil engineering so as to enable the students to apply the knowledge of these principles to the field of bioprocess engineering.	- General Engineering
4.	Ability to read and interpret drawings related to plant layout, process equipment and components.	- Engineering Drawing - Process Equipment Design & Drawing
5.	Knowledge of various materials used in biochemical processes, their properties and specifications.	- Microbiology - Biochemistry
6.	Knowledge and associated skills of various unit operations, unit processes and process instrumentation in process industry.	- Introduction to Food technology - Fluid Flow - Heat Transfer - Separation operation - Mass Transfer - Process Instrumentation - Food Engg. - Dairy Technology - Cereal Technology - Meat & poultry Technology - Fruit and vegetable Technology
7.	Ability to calculate the quantity of raw materials, energy inputs, manpower requirement and output from the process.	- Introduction to Food technology
8.	Ability to control the process and quality of the products commiserating with laid specifications.	- Elective/Specializations - Food Industries - Food Chemistry - Food microbiology
9.	Understanding of basic principles of managing men, material and machines/ equipment for optimum production.	- Entrepreneurship Development and Management

10.	Appreciation of the need of clean environment and its deterioration by various emissions from industry and preventive procedures and knowledge of safety regulations in process industry.	- Environmental Engineering and Safety - Plant Safety Management
11.	Development of generic skills of thinking and problem-solving, communication, attitudes and value system for effective functioning in a process industry.	- Industrial Visits - Project Work
12.	Proficiency in the use of computers.	- Computer Applications in Engineering - Basics of Information Technology
13.	Basic manual and machining skills as an aid to function effectively in the process industry.	- General Workshop Practice
14.	Knowledge of testing and quality control activities.	- Food processing Industries
15.	Development of good personality in order to have effective communication and business ethics.	- Student Centered activity

ABSTRACT OF CURRICULUM AREAS/SUBJECTS

(a) Basic Sciences and Humanities

1. Communication Skills
2. Basics of Information Technology
3. Entrepreneurship Development and Management

(b) Applied Sciences

4. Applied Mathematics
5. Applied Physics
6. Applied Chemistry
7. Organic Chemistry
8. Physical Chemistry

(c) Basic Courses in Engineering/Technology

9. Engineering Drawing
10. General Workshop Practice
11. General Engineering

(d) Applied Courses in Engineering/Technology

1. Introduction to Food technology
2. Food Microbiology
3. Food chemistry
4. Fluid Flow and Heat transfer
5. Mass Transfer
6. Environmental Engineering and Safety

7. Process Instrumentation
8. Food Quality Control
9. Plant Safety Management
10. Food Hygiene and Sanitation
11. Minor Project
12. Major Project

(e) Specialized Courses in Engineering/Technology)
(Electives, any one of the following)

13. Food Packaging
14. Fermentation Technology

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 3rd Semester(FOOD TECHNOLOGY)(wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	EndSem Exams	Exams (Hours)	Total
		Theory							
Th.1		Physical Chemistry(C)	4	-	-	20	80	3	100
Th.2		Fruits and vegetables technology	4	-	-	20	80	3	100
Th.3		Food and Nutrition	4	-	-	20	80	3	100
Th.4		Food Engineering 1	4	-	-	20	80	3	100
Th.5		Environmental studies(C)	4	-	-	20	80	3	100
		Total	20	-	-	100	400	-	500
		Practical							
Pr.1		Physical Chemistry Lab(c)	-	-	4	25	25	3	50
Pr.2		Fruits and vegetables Tech Lab	-	-	4	25	25	3	50
Pr.3		Food Engineering Lab 1	-	-	5	50	25	3	75
Pr.4		Environmental Engg. Lab(C)			3	25	25	3	50
		Student Centred Activities(SCA)	-	-	3	25	-	-	25
		Total	-	-	*19*	*150*	*100*	-	*250*
		Grand Total	**20**	**-**	**19**	**250**	**500**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

Th1. **PHYSICAL CHEMISTRY**

(Common to Chemical, Biotechnology & Food Technology)

Name of the Course: Diploma in food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Theory periods	**4p/week**	**Internal assessment**	**20**
Maximum Marks	**100**	**End Semester Exam.**	**80**

A. Rationale:

The phenomenal progress of technology in the 20th century has brought dramatic changes in human life styles. The technology, which has thus enhanced the quality of human life, is evolved based on scientific research, primarily physical, inorganic and organic Chemistry. Use of various organic and inorganic compounds and their physical phenomenon are very much essential for any process industry. Therefore the knowledge of Chemistry is necessary for the success of Chemical Engineers, Biotechnologists and Food Technologists.

B. Objective:

On completion of study of Physical Chemistry the student will be able to:

1. Conceptualise physical properties of liquid.
2. Understand solution and its properties.
3. Understand the concept of Osmosis and Osmotic Pressure
4. Explain distribution law.
5. Understand the concept of colloids.
6. Understand the concept of Adsorption

B. Topic wise distribution of periods		
Sl. No.	**Topics**	**Periods**
1	Physical Properties of Liquids	10
2.	Solutions	12
3.	Osmosis and Osmotic Pressure	12
4.	Distribution Law	08
5.	The Colloids	10
6.	Adsorption	08
	Total	**60**

D. COURSE CONTENT:

1.0 PHYSICAL PROPERTIES OF LIQUIDS

1.1 Intermolecular forces in liquid.
1.2 Vapour pressure and its effect on temperature and boiling point.
1.3 Surface tension.
1.4 Viscosity and measurement of viscosity by Ostwald method.
1.5 Refractive index, specific refraction, determination of refractive index
1.6 Optical activity and measurement of optical activity.

1.7 Solve simple problems based on physical properties of liquid.

2.0 SOLUTIONS

2.1 Solution and Types of solutions.
2.2 Ways of expressing concentration.
2.3 Solve numerical related to concentration.
2.4 The solution of gases in gases.
2.5 Henry's law and solve numerical related to it.
2.6 Solutions of liquid in liquids.
2.7 Solubility of partially miscible liquids
2.8 Solubility of solid in liquid and equilibrium concept, solubility curve.
2.9 Raoult's Law, ideal solution and explain the lowering of vapour pressure and its measurement.
2.10 Concept of elevation of boiling point and depression of freezing point

3.0 OSMOSIS AND OSMOTIC PRESSURE.

3.1 Osmosis and osmotic pressure with example.
3.2 Function of semi permeable membrane.
3.3 Osmotic pressure and isotonic solutions.
3.4 The theories of Osmosis.
3.5 Reverse osmosis.
3.6 The laws of osmotic pressure.
3.7 Solve the Simple Problems.
3.8 Relation between Vapour Pressure & Osmotic Pressure.

4.0 DISTRIBUTION LAW.

4.1 Nernst's distribution law.
4.2 Equilibrium constant from distribution coefficient.
4.3 Extraction with a solvent, multiple extraction
4.4 Concept of liquid-liquid chromatography.
4.5 Applications of distribution law.
4.6 Numerical based on distribution law.

5.0 COLLOIDS.

5.1 Colloids & types of colloidal systems.
5.2 Characteristics of sols.
5.3 The application of colloids.
5.4 Methods of preparation of sols & purification of sols.
5.5 The optical, kinetic and electrical properties of sols.
5.6 Emulsion and types of emulsion.
5.7 The role of Emulsifier.
5.8 The preparation of Emulsions and their properties.
5.9 Gel, type of gel, properties and application.

6.0 ADSORPTION.

6.1 Adsorption
6.2 Compare absorption and adsorption
6.3 Types of adsorption.
6.4 Physical adsorption and Chemisorption.
6.5 The application of adsorption
6.6 The Ion- exchange adsorption and discuss its application.

Syllabus Coverage up to I.A

Chapter 1,2,3,4

Learning Resources:

Sl No	Author	Title	Publication
1	B.S. Bahl, H.D. Tuli, A. Bahl	“ Essentials of Physical Chemistry”	S. Chand & Co.

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Th2. FRUITS AND VEGETABLE TECHNOLOGY

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Theory periods	**4p/week**	**Internal assessment**	**20**
Maximum Marks	**100**	**End Semester Exam.**	**80**

A. Rationale :

Food technologist is concerned with the design, adaptation and successful operation of processing plant to produce a suitable stable edible product from unstable food materials. For the above purpose the students should well acquainted with canning, drying and preservation of food products for a longer period for utilisation.

B. Objective

As all the fruits & vegetable are seasonal, their storage, processing, preparation of fruits & vegetable products is highly essential. The students after completion of this paper is well concerned with the storage, preservation, processing & preparation of their products. They also will know details about the preparation of spice powder & condiment products.

Sl. No.	Topics	Periods
1	Physiology	05
2.	Storage of fresh fruits& vegetables	05
3.	Processing	10
4.	Preservation of fruits & vegetables	10
5.	Fermented fruits & vegetables	10
6.	Preparation of spices & condiments	10
7.	Preparation of non- alcoholic beverages	10
	TOTAL	**60**

Topics
1.0 Physiology 1.1 Classification & Nutritive value of fruits & vegetables. 1.2 Transpiration, respiration, ripening and their effects 1.3 Harvesting & processing of fruits & vegetables
2.0 Storage of fresh fruits and vegetables 2.1 Microbiology of fresh fruits and vegetables 2.2 Spoilage and its control 2.3 Principles and methods of storage-cold storage, atmosphere storage, gas storage, hypobaric storage, pre-cooling, radiation, waving etc
3.0 Processing 3.1 Processing of vegetables: Potato chips, French fries, frozen patties, sweet potato chips, flakes, *Tomato* -juice, puree, sauce, ketchup, chutney. *Mushroom*-freeze drying, pickles, dehydration 3.2 Processing of fruits: Jam, Jelly, squash, marmalade, pickles, vinegar

3.3 Study the effect of processing on the nutritive value of fruits and vegetables
4.0 Preservation of fruits and vegetables 4.1 Preserve fruits and vegetables by heat, chemicals, sugar, salt, fermentation, drying
5.0 Fermented fruit and vegetable products 5.1 Definition of Fermented foods 5.2 Pickling and curing of foods
6.0 Preparation of spices and condiment products 6.1 Classification 6.2 Processing of spice and condiment products 6.3 Adulteration of spices.
7.0 Preparation of non-alcoholic beverage 7.1 Processing tea, coffee, and cocoa and their products 7.2 Processing of fruit juices.

Syllabus Coverage up to I.A

Chapter 1,2,3,4,5

Learning Resources:

Sl No	Author	Title	Publication
1	Giridhari Lal	Preservation of fruits & vegetables	ICAR, Publication
2	Siddappa	Processing of fruits & vegetables	
3	Wudrufv & Luh	Commercial fruits & vegetables processing	AVI, Publication

Th3. FOOD AND NUTRITION

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Theory periods	**4p/week**	**Internal assessment**	**20**
Maximum Marks	**100**	**End Semester Exam.**	**80**

A. Rationale :

Food technologist is concerned with the design, adaptation and successful operation of processing plant to produce a suitable stable edible product from unstable food materials. For the above purpose the students should well acquainted with canning, drying and preservation of food products for a longer period for utilisation.

C. Objective

The students after completion of study should be concerned with the storage life of food products to ensure the consumer receives them in optimum condition. To this end, it is essential to understand the nature and limitations of packaging material and their use. This paper will explain everything to the students about canning and packaging.

C. Topic wise Period distribution	Hours
1.0 Food & our Body	15
2.0. Menu Planning & Meal Preparation	15
3.0. Balanced diet and Nutrition during normal life cycle	10
4.0. Assessment of Nutritional status	10
5.0. Malnutrition and Nutrition programmes.	10
Total	60

Content
1.0 Food & our Body

1.1. Introduction to food and nutrients 1.2. Functions of foods. 1.3. Basic food groups. 1.4. Energy metabolism 1.5. Specific Dynamic action. 1.6. Nutritive value of foods 1.7. Calorific value of foods. 1.8. Recommended dietary allowances for Indians.
2.0. Menu Planning & Meal Preparation 2.1. Developing good eating habits. 2.2. Food misinformation. 2.3. Menu planning for the family. 2.4. Menu planning for hospital settings.
3.0. Balanced diet and Nutrition during normal life cycle 3.1. Balanced diet. 3.2. Diets during a normal life cycle. 3.3. Nutrition during pregnancy. 3.4. Nutrition during lactation. 3.5. Nutrition from infancy to adolescence. 3.6. Ways of measuring growth.
4.0. Assessment of Nutritional status 4.1. Nutritional assessment of a community. 4.2. Methods of assessment of nutritional status. 4.3. Nutrition surveys. 4.4. Diet surveys.
5.0. Malnutrition and Nutrition programmes. 5.1. Causes and consequences of malnutrition in India. 5.2. Protein Energy Malnutrition. 5.3. Vitamin Deficiency. 5.4. Deficiency of minerals. 5.5. Current Nutrition programme in India. 5.6. Food fortification, food enrichment, food restoration.

Syllabus Coverage up to I.A

Chapter 1,2,3,4

Learning Resources:

Sl No	Author	Title	Publication
1	R.M begum	A text book of food, nutrition, deitics	Sterling publishers pvt.ltd
2	Annie Fredrick	A text book of food, nutrition	Lotus press
3	Subhangini A Joshi	Nutrition & dietics	Tata Mc graw hill

Th4. FOOD ENGINEERING 1

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Theory periods	**4p/week**	**Internal assessment**	**20**
Maximum Marks	**100**	**End Semester Exam.**	**80**

A. Rationale :

Food technologist is concerned with the design, adaptation and successful operation of processing plant to produce a suitable stable edible product from unstable food materials. For the above purpose the students should well acquainted with canning, drying and preservation of food products for a longer period for utilisation.

B. Objective

The students after completion of study should be concerned with the storage life of food products to ensure the consumer receives them in optimum condition. To this end, it is essential to understand the nature and limitations of packaging material and their use. This paper will explain everything to the students about canning and packaging.

Topic wise Distribution			
Sl. No.	**Name of the Topics**	**Hours**	**Marks**
1	**Introduction**	5	05
2.	**Preservation and Processing by heat**	10	15
3.	**Preservation and Processing by Cold**	10	10
4.	**Dehydration and Concentration**	15	10
5.	**Fermentation**	08	10
6.	**Food irradiation**	07	10
7.	**Food Preservatives**	10	10
8	**Food packaging**	10	10
	Total	60	80

CONTENTS: Theory

Sl. No.	Name of the Topics
1	**Introduction** 1.1 General introduction to food technology 1.2 Principles of food preservation 1.3 Methods of food preservation

2.	**Preservation and Processing by heat** 2.1 Effect of Heat on Micro-organisms 2.2 Thermal Death Time (TDT) Curve 2.3 Environmental factors 2.4 Canning 2.5 Pasteurization & Sterilization
3.	**Preservation and Processing by Cold** 3.1 Effect of cold on micro-organism 3.2 Types of cold preservation 3.3 Study & construction of cold storage
4.	**Dehydration and Concentration** 4.1 Advantages of drying and drying rate 4.2 Changes during drying 4.3 Methods of drying 4.4 Intermediate moisture foods 4.5 Methods of concentration
5.	**Fermentation** 5.1 Fermentation & benefits of fermentation 5.2 Microbial activities in foods 5.3 Control of fermentation in foods
6.	**Food irradiation** 6.1 Kinds of ionising radiations 6.2 Radiations effects. 6.3 Uses of radiations
7.	**Food Preservatives** 7.1 Classification of food preservatives(class1 and 2) 7.2 Salt: Mechanism of action, food pickling and curing 7.3 Sugar: Types, uses and mechanism of action against micro- organisms 7.4 Chemical preservatives: importance and mechanism of action of benzoic acid , KMS, Sodium benzoate
8	**Food packaging** 8.1 Introduction to Food packaging 8.2 Importance and function of food packaging. 8.3 Study types of rigid and flexible packaging

Syllabus Coverage up to I.A

Chapter 1,2,3,4,5,6

Learning Resources:

Sl No	Author	Title	Publication
1	N.N Potter	Food Science	CBS Publications
2	Karel and Luno Marcel Defker	Principles of food science II Volumes-	Lotus press
3	Fannema	Nutrition & dietics	CBS Publications
4.	Moris, Chapman & Hall	Principles of food Preservation	
5.	R. Lees, C. R. C.	Food Analysis	Press Inc

Th5. ENVIRONMENTAL STUDIES

(Common to all Branches)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVE:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. Topic wise distribution of periods:

Sl. No.	Topics	P
1	The Multidisciplinary nature of environmental studies	
2	Natural Resources	
3	Systems	
4	Biodiversity and it's Conservation	
5	Environmental Pollution	
6	Social issues and the Environment	
7	Human population and the environment	
	Total:	

D. COURSE CONTENTS

1. The Multidisciplinary nature of environmental studies:

1.1Definition, scope and importance.

1.2Need for public awareness.

2. Natural Resources:

Renewable and non renewable resources:

2.1 Natural resources and associated problems.

2.1.1. Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.

2.1.2. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.

2.1.3. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.

2.1.4. Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .

2.1.5. Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

2.1.6. Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

2.2 Role of individual in conservation of natural resources.

2.3 Equitable use of resources for sustainable life styles.

3. Systems:

3.1. Concept of an eco system.

3.2. Structure and function of an eco system.

3.3. Producers, consumers, decomposers.

3.4. Energy flow in the eco systems.

3.5. Ecological succession.

3.6. Food chains, food webs and ecological pyramids.

3.7. Introduction, types, characteristic features, structure and function of the following eco system:

3.8. Forest ecosystem:

3.9. Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and it's Conservation:

4.1. Introduction-Definition: genetics, species and ecosystem diversity.

4.2. Biogeographically classification of India.

4.3. Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
4.4. Biodiversity at global, national and local level.
4.5. Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

5. Environmental Pollution:

5.1. Definition Causes, effects and control measures of:

5.1.1 Air pollution.
5.1.2 Water pollution.
5.1.3 Soil pollution
5.1.4 Marine pollution
5.1.5 Noise pollution.
5.1.6 Thermal pollution
5.1.7 Nuclear hazards.

5.2. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
5.3. Role of an individual in prevention of pollution.
5.4. Disaster management: Floods, earth quake, cyclone and landslides.

6. Social issues and the Environment:

6.1. Form unsustainable to sustainable development.
6.2. Urban problems related to energy.
6.3. Water conservation, rain water harvesting, water shed management.
6.4. Resettlement and rehabilitation of people; its problems and concern.
6.5. Environmental ethics: issue and possible solutions.
6.6. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
6.7. Air (prevention and control of pollution) Act.
6.8. Water (prevention and control of pollution) Act.
6.9. Public awareness.

7. Human population and the environment:

7.1. Population growth and variation among nations.
7.2. Population explosion- family welfare program.
7.3. Environment and human health.
7.4. Human rights.
7.5. Value education
7.6. Role of information technology in environment and human health.

Syllabus coverage up to Internal assessment

Chapters: 1, 2 and 3.

Learning Resources:

Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Textbook of Environmental studies	Erach Bharucha	#UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand & Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd.
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

Pr1. PHYSICAL CHEMISTRY LABORATORY
(Common to Chemical, Biotechnology & Food Technology)

Practical-1

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Lab periods	**4p/week**	**Internal assessment**	**25**
Maximum Marks	**50**	**End Semester Exam.**	**25**

A. RATIONALE: In view of the fact that there are, as a rule, available for laboratory work' not more than two and one-half hours at a time, it has been found desirable to have the different pieces of apparatus set up beforehand by the instructor. To this end, each experiment is preceded by an exact list of the apparatus and chemicals needed. It is believed that this will materially aid the instructor in assembling the necessary equipment. At the Rensselaer Polytechnic Institute, the laboratory course immediately follows the completion of the theoretical course in physical chemistry, and students are thus prepared to take up the study of any experiment herein listed. It is therefore found practical to prepare the equipment for one or two units of each exercise before the laboratory course starts, and to shift the student successively from one experiment to another. In this way, an excessive amount of preparatory work is avoided.

B. OBJECTIVE:

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

1. Understand the interconnection between experimental foundation and underlying theoretical principles and to appreciate the limitations inherent in both theoretical treatments and experimental measurements.
2. Gain familiarity with a variety of physico-chemical measurement techniques.
3. Develop laboratory skills and the ability to work independently.
4. Name salts, acids, bases and covalent compounds and provide formulas for these given a molecular formula.
5. Explain the difference between solubility and dissociation in water and apply this knowledge to acids, bases and salts.

C. Course content in terms of specific objectives:

1. Preparation of standard solution of an acid and alkali
2. Determine the viscosity of a liquid by Red wood viscometer at different temperatures and plotting graph between viscosity and temperature.
3. To determine the partition coefficient of iodine between water and carbon tetrachloride.
4. To determine the partition coefficient of benzoic acid between water and benzene at room temperature and molecular state of Benzoic acid in benzene as compared to its solution in water.
5. To prepare colloidal solution of starch.
6. To prepare colloidal solution of egg albumin.
7. Determine the solubility of a given salt at room temperature and also draw its solubility curve.
8. To determine the adsorption isotherm of acetic acid by activated charcoal.
9. To investigate the adsorption of oxalic acid from aqueous solution of activated charcoal and examines the validity of Freundlich and Langmuir's adsorption isotherm.
10. To determine the rate constant for hydrolysis of ethyl acetate catalyzed by hydrochloric acid

Learning Resources:

Sl No	Author	Title	Publication
1	Dr S Basin and Dr. Sudha Rani	Laboratory Manual on Engineering Chemistry	Dhanpat Rai Publishing company

Pr2. FRUITS AND VEGETABLE TECHNOLOGY Lab

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**60**	**Examination**	**3hrs**
Lab periods	**4p/week**	**Internal assessment**	**25**
Maximum Marks	**50**	**End Semester Exam.**	**25**

A. Rationale :

Food technologist is concerned with the design, adaptation and successful operation of processing plant to produce a suitable stable edible product from unstable food materials. For the above purpose the students should well acquainted with canning, drying and preservation of food products for a longer period for utilisation.

B. Objective:

On completion of study of Fruits and vegetable lab , the student will be able to:

1. To develop and test strategies, applicable for promoting consumption of fruits and vegetables.
2. To provide new information of great importance for improving our understanding of consumption patterns of fruits and vegetables.

B. Course objectives of Specific Subjects

Sl. No.	Name of Experiment	No .of periods
1	Study of cold storage of fruits & vegetables.	06
2	Prepare and preserve of fruits & vegetables juice.	06
3	Prepare concentration of fruits & vegetables juice.	06
4	Prepare jam, jelly ,pickles, chutney, Vinegar, tomato products, marmalade	09
5	Study and demonstrate the freezing and dehydration of fruits and vegetables.	06
6	Prepare intermediate fast food.	06
7	Prepare fermented food (fruits and vegetable product)	03
8	Sensory evaluate different food characteristics (food colour, flavour, texture, shape)	03
9	Analysis different quality parameters of food.	03

10	Study and demonstrate different methods of juice & pulp extraction.	03
11	Assess the adequacy of blanching	03
12	Bottling of peas	03
13	Examination of canned Pineapple.	03

Pr3. FOOD ENGINEERING LABOROTORY

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**75**	**Examination**	**3hrs**
Lab periods	**5p/week**	**Internal assessment**	**25**
Maximum Marks	**50**	**End Semester Exam.**	**25**

A. Rationale :

Food technologist is concerned with the design, adaptation and successful operation of processing plant to produce a suitable stable edible product from unstable food materials. For the above purpose the students should well acquainted with canning, drying and preservation of food products for a longer period for utilisation.

B. Objective

1.On completion of study of Food Engineering lab , the student will be able to:
concerned with the storage life of food products to ensure the consumer receives them in optimum condition.

2.To understand the nature and limitations of packaging material and their use.

3.to understand the canning and packaging.

C. Course objectives of Specific Subjects

Sl.No.	Name of Experiment	No .of periods
1	Study and operation of bottle washing machine.	10
2	Testing of can and study and operation of can sealing machine.	20
3	study and operation of can reformer.	5
4	Extract fruits& vegetable juice ,using pulpar and prepare tomato products and preserve.	5
5	Preserve fruits and vegetables by canning.	5
6	Prepare and preservation of different juice.	10
7	Measurement of thickness, grammage of different material.	5
8	**Process Flow sheet of** • Tomato products viz. Sauce, chutney, tomato powder, pickles • Bakery products viz. Biscuits, cookies, wafers , bread. • Confectionary products viz. Chocolates, candies. • Fruit products viz. Jam, jelly, squash . • Vegetable products viz. Dehydrated products, pickles. • Dairy products viz. Milk, butter, paneer , ghee, cheese etc • Snack foods • Alcoholic beverages viz. Beer, wine, whisky, rum • Meat Products &Sea food Processing viz. Fish, prawn	15

Pr4. ENVIRONMENTAL ENGINEERING LAB

Name of the Course: Diploma in Food Technology			
Course period		**Semester**	**3rd**
Total period	**45**	**Examination**	**4hrs**
Lab periods	**3p/week**	**Internal assessment**	**25**
Maximum Marks	**50**	**End Semester Exam.**	**25**

A. Rationale:

Practicals are an integral part of understanding and learning a particular subject. For the course in Environmental Science, practicals include field studies, laboratory exercises (analysis), and creative activities. These exercises are not only relevant to get a better understanding of environment but also provide hands-on experience at devising methods for preventing environmental degradation.

B. Objective:

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

1. Find out the amount of dissolved oxygen in the given sample of water.
2. Determine Biological Oxygen Demand (BOD) of a given sample of water.
3. Find out the chemical oxygen demand (COD) of a water sample .
4. Determine the pH and Conductivity and turbidity of given water samples.
5. Determination of pH and conductivity of soil/ sludge samples.
6. Find out the total dissolved solid in the given water sample

D. **Course content in terms of specific objectives:**

SL. No.	Topic	Periods
1	Collection of sample of waste water	03
2	Analyze a given sample of waste water for estimation of dissolved chloride	06
3	Determine the dissolved oxygen content of water by Winkler's method	03
4	Determine the chemical oxygen demand (BOD) exerted by a given sample of waste water	03
5	Determine the chemical oxygen demand (COD) of a given sample of waste water`	06
6	Determine the turbidity of a given sample of waste water	06

7	Determine the total dissolved solid in a given sample of waste water	06
8	Determine the optimum amount of coagulant required to treat to turbid water	06
9	Determine the amount of sulphate in a given sample of water.	06