

BRANCH : FOOD TECHNOLOGY

Semester: III

SI No .	Subject	Teaching scheme (hours/work)			Evaluation Scheme						Total mark
		L	T	P	Theory			Practical			
	Theory & Practical			End Exam	Internal Assessment		End Exam	Sessional			
					Class Test	Assignment					
1.	Physical Chemistry	3	1	4	80	15	5	25	25	150	
2.	Organic Chemistry	3	1	4	80	15	5	25	25	150	
3.	Industry Stoichiometry	3	1	0	80	15	5	-	-	100	
4.	Fundamental of Microbiology	3	1	3	80	15	5	25	25	150	
5.	Food Engineering	3	1	3	80	15	5	25	25	150	
6.	Technical Seminar			3					50	50	
7.	Industry Visit			2							
	Total	15	5	19	400	75	25	100	150	750	

PHYSICAL CHEMISTRY

L T P
3 1 4

Curri. Ref. No. : FT-301

Total Contact hrs. : Total Marks : 100
60

Theory Exam. : 3 hrs.
End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Assignment : 05 Marks

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 Biotechnologists.

Objectives : 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.
7. Understand the concept of photochemistry.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Physical Properties of Liquids	10	14
2.	Solutions	09	12
3.	Osmosis and Osmotic Pressure	09	09
4.	Distribution Law	08	09
5.	The Colloids	08	12
6.	Adsorption	08	12
7.	Chemical Kinetics	08	12

	TOTAL	60	80
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COURSE CONTENT:

1.0 PHYSICAL PROPERTIES OF LIQUIDS

- 1.1 Outline the kinetic molecular description and intermolecular forces in liquid.
- 1.2 Define vapour pressure and determine vapour pressure by static and dynamic method.
- 1.3 Define surface tension and determine surface tension by capillary-rise method and drop formation method.
- 1.4 Define viscosity and measurement of viscosity by Oswald method.
- 1.5 Define refractive index, specific refraction.
- 1.6 Define optical activity and measurement of optical activity.
- 1.7 Solve simple problems based on physical properties of liquid.

2.0 SOLUTION:

- 2.1 Define solution and concentration of solution
- 2.2 Classify solutions
- 2.3 Solve numerical related to concentration
- 2.4 Discuss solubility of partially miscible liquids
- 2.5 State Rault's Law and explain the lowering of vapour pressure and its measurement.

3.0 OSMOSIS AND OSMOTIC PRESSURE

- 3.1 Explain osmosis and osmotic pressure with example
- 3.2 Describe the function of semi permeable membrane.
- 3.3 Determine Osmotic pressure.
- 3.4 Explain the theories of Osmosis
- 3.5 Explain reverse osmosis

4.0 DISTRIBUTION LAW:

- 4.1 State and explain Nerst's distribution law
- 4.2 Determination of equilibrium constant from distribution coefficient
- 4.3 Discuss the concept of liquid-liquid chromatography
- 4.4 Describe the applications of distribution law.

5.0 COLLOIDS:

- 5.1 Define colloids
- 5.2 Discuss types of colloidal systems
- 5.3 Discuss characteristics and properties of lolls
- 5.4 Explain methods of preparation of lolls
- 5.5 Explain methods of purification of lolls
- 5.6 Discuss the optical, kinetic and electrical properties of lolls.
- 5.7 Define emulsion and explain types of emulsion.

- 6.0 ADSORPTION:
 - 6.1 Define adsorption
 - 6.2 Compare absorption and adsorption
 - 6.3 Discuss types of adsorption
 - 6.4 Compare physical adsorption and Chemisorption
 - 6.5 Explain Langmuir adsorption isotherm.
- 7.0 PHOTO CHEMISTRY:
 - 7.1 Define and demonstrate photochemical reaction
 - 7.2 Compare photochemical and thermal reaction
 - 7.3 Discuss the laws of photochemistry
 - 7.4 Discuss primary and secondary reaction
 - 7.5 Discuss different photo physical processes.

TEXT BOOK:

- 1.0 B.S.Bahi, H.D. Tuli, A.Bahi, "Essentials of Physical Chemistry" S.Chand & Co.

REFERENCE BOOKS:

- 1. K.K.Sharma, L.K.Sharma: Physical Chemistry.
- 2. Puri, Sharma, Pathania: Principle of Physical Chemistry.

PHYSICAL CHEMISTRY

L T P
0 0 4

Curri. Ref. No. : FT- 301

Total Contact hrs. :
60

Total Marks : 50

Theory Exam. : 4 hrs.
End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 60

Sl.No.	Name of Experiment	No.of perids
1	Determine the viscosity of a liquid by Red wood viscometer at different temperatures and plotting graph between viscosity and temperature	06
2	Determine the refractive index of different liquids and hence specific and molar refraction	06
3	To determine the percentage of two optically active substances in a given solution polar metrically	06
4	To determine the value of rate constant(k) for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.	06
5	To determine the partition coefficient of iodine between water and carbon tetrachloride	06
6	To determine the paertition coefficient of benzole acid between water and benzene at rood temperature and molecular state of Benzoic acid in benzene as compared to its lolution in water	06
7	To prepare colloidal solution of starch and eff albumin	06
8	To study the dislysis of starch sol containing soduum chloride through a cell phone of parchment paper	06
9	To determine the adsorption isotherm of acetic acid by activated charcoal	06
10	To investigate the adsorption of oxalic acid from aqueous solution of activated charcoal and examines the validity of Freundlich and Langmuir's adsorption isotherm.	06

REFERENCWE BOOKS:

1. Physical Chemistry by Dr. Sudharani.
2. Advanced Practical Physical Chemistry by J.B.Yadav.

ORGANIC CHEMISTRY

L T P
3 1 0

Curri. Ref. No. : FT-302

Total Contact hrs. :
60

Total Marks : 100

Theory Exam. : 3 hours
End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Assignment : 05 Marks

Rationale :

Study of organic chemistry as a separate subject is more practical and fruitful. The knowledge of structure and function of a large no. of compounds built of relatively few elements is important for future bio-technologist.

Objectives : On completion of study of Organic Chemistry, the student will be able to

1. Name organic compound in IUPAC system
2. Understand the concept of isomerisation
3. Acquaint themselves with methods preparation, properties and use of common aromatic and aliphatic compounds.
4. Acquire knowledge carbohydrates, proteins and amino acids.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Nomenclature	15	10
2.	Aliphatic Compounds	18	30
3.	Aromatic Compounds	07	10
4.	Carbohydrates, Proteins and fats	20	30
	TOTAL	60	80

COURSE CONTENT:

1.0

- 1.1 Understand scope of organic chemistry
- 1.2 Differentiate organic compound and inorganic compounds
- 1.3 Outline the importance of organic Chemistry in modern life
- 1.4 Explain the structure of organic compound
- 1.5 Classify organic compound
- 1.6 Name aliphatic compounds as per IUPAC system
- 1.7 Name the aromatic compounds as per the IUPAC system
- 1.8 Illustrate isomerisation with examples.

2.0 ALIPHATIC COMPOUNDS:

- 2.1 Explain the methods of preparations, properties and uses of methane and ethane.
- 2.2 Explain the methods of preparations properties of ethylene
- 2.3 Explain the methods of preparation, properties and uses of acetylene
- 2.4 (a) Explain how to distinguish between 1, 2, 3 alcohol
(b) Explain the methods of preparation properties and uses of methanol and ethanol.
(c) Explain absolute alcohol and denatured alcoholic

3.0 AROMATIC COMPOUNDS:

- 3.1 Explain the methods of preparation, properties and uses of
(a) Benzene
(b) Toluene

4.0 CARBOHYDRATES, PROTEINS AND FATS:

- 4.1 Classify and name carbohydrates
- 4.2 Explain the synthesis and inter conversions of monosaccharides
- 4.3 Explain the manufacturing properties and uses of glucose, fructose, sucrose, and lactose.
- 4.4 Define Amino acid, Peptides and proteins
- 4.5 Classify proteins and Fats
- 4.6 Explain the properties and uses of proteins and Fats
- 4.7 Explain the synthesis of amino acids.

TEST BOOKS

- 1.0 Advanced organic Chemistry by B.S. Bahi, Arun Bahi. Tuli & Soni

ORGANICS CHEMISTRY LABORATORY

L T P
0 0 4

Curri. Ref. No. : 302

Total Contact hrs. : 60

Total Marks : 50

Theory Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 60

Sl.No.	Name of Experiment	No.of perids
1	Detect the following elements in the organic compound i) Nitrogen ii) Sulphur iii) Halogen	10
2	Determine different functional groups of i) Acids ii) Alcohols iii) Aldehydes iv) Ketones v) Esters vi) Phenol vii) Amines viii) Nitro ix) Amide x) Carbohydrate	20
3	Systematic qualitative analysis of organic compound	10
4	Determine boiling point and melting point	
5	Prepare i) Nitrobenzene ii) Phenolphthalein iii) Methyl orange	10

INDUSTRIAL STOICHIOMETRY

L *T* *P*
3 1 0

Curri. Ref. No. : 303

Total Contact hrs. : 60
Theory : 60

Total Marks : 100

Theory Exam. : 3 hrs.
End Exam. : 80 Marks

Practical : Nil

I.A. : 15 Marks

Assignment : 05 Marks

Rationale :

In process industries raw materials are processed to get different products. The components present in the raw material combine in a definite proportion and the percentage of product formed depend on various parameters like temperature and pressure etc.. It is highly essential to know the stoichiometry ratio and proportions and the process conditions to achieve maximum product formation and recycle of the unused materials for better economy. Therefore, knowledge of stoichiometry is the first and foremost requirement for the success of a process engineer.

Objectives : On completion of study of industrial stoichiometry the student will be able to

1. Differentiate between different units and dimensions, dimensional analysis and solve relevant problems
2. Compare density, specific gravity etc.of gaseous mixtures
3. Estimate quantitative requirement of materials for a chemical reaction
4. Understand the concept of equilibrium vaporization and condensation
5. Workout raw material requirement for a chemical process from material balance equation.
6. Calculate energy requirement for a chemical process from energy balance equation.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Units and dimension	03	04
2.	Gases	08	08
3.	Stoichiometry	08	08
4.	Liquids & Vapours	06	12
5.	Material balance without chemical reaction	12	16
6.	Material Balance involving chemical reaction	12	16
7.	Energy Balance	08	12
8.	Use of graphs	03	04
	Total	60	80

COURSE CONTENT

- 1.0 **UNITS AND DIMENSIONS**
 - 1.1 Name the units and dimensions of different quantities used in chemical Engg. And their conversion
- 2.0 **GASES**
 - 2.1 Explain behaviour of ideal gas, real gas, Vander wall equation for real gas
 - 2.2 Compute densities, specific gravity, average molecular weight of gaseous mixtures
 - 2.3 Define mole percentage, weight percentage, volumetric percentage and their conversion
- 3.0 **STOICHIOMETRY**
 - 3.1 Define stoichiometry
 - 3.2 Define equivalent weight, molecular weight, molecular formula, empirical formula and solve some problems on it
 - 3.3 Solve problems on chemical reaction on mass-mass, mass-volume basis
- 4.0 **LIQUIDS AND VAPOURS**
 - 4.1 Explain vaporization, liquefaction, vapour pressure
 - 4.2 Explain boiling point diagram
 - 4.3 Explain Raoult's Law and solve simple problems on it
 - 4.4 State and explain Henry's Law
- 5.0 **MATERIAL BALANCE WITHOUT CHEMICAL REACTION**
 - 5.1 State Law of conservation of mass
 - 5.2 Explain material balance
 - 5.3 Solve problems on material balance based on unit operations like mixing, evaporation, distillation, drying, humidification, extraction, absorption

- 6.0 **MATERIAL BALANCE INVOLVING CHEMICAL REACTION**
- 6.1 Define limiting reactant, excess reactant, stoichiometric ratio
 - 6.2 Solve problems based on material balance involving chemical reaction
 - 6.3 Explain recycle and bypass concept and their industrial application
 - 6.4 Solve simple problems based on recycle operation
- 7.0 **ENERGY BALANCE**
- 7.1 State law of conservation of energy and explain energy balance
 - 7.2 Define heat capacity and evaluate simple problems on it
 - 7.3 Define standard heat of reaction, formation, combustion, neutralization and calculate problems on it
 - 7.4 State and explain Hess's law and simple problems on it
 - 7.5 Explain Kirchoff's Law.
- 8.0 **USE OF GRAPHS IN CHEMICAL ENGG**
- 8.1 Compare different types of graphs like log-log, semi log and triangular graphs.

Reference Books :

1. Chemical process principle, Vol.- I, Hougen and Watson
2. Stoichiometry – Bhatt & Vora
3. Solved Examples in Chemical Engg. – G. K. Roy.

FUNDAMENTALS OF MICROBIOLOGY

L T P
3 1 0

Curri. Ref. No. : FT-304

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Rationale :

Foodstuffs by their very nature provide ideal media in which all types of microorganisms can grow. It is essential for the food technologist to understand the factors influencing microbial growth in order to harness and encourage desirable organisms, and to discourage and destroy those organisms that have deleterious effect on food substrates.

There are enormous annual issues of food materials, throughout the world, which are attributable directly to spoilage by the action of "microorganisms". Such losses may have far reaching economic and political results as for example, the great potato blight in Ireland during the nineteenth century.

Many bacteria, fungi and viruses cause food poisoning infections and information which may vary in severity from the very mild to the fatal.

On the credit side, there are many microorganisms whose metabolic processes have contrubetes the production of foods and baverages from the earliest times. Food commodities such as bread, fermented milk and vegeables and alcoholic beverages have a significant place in the diet of today. Knowledge of the organisms respob sible for such products is essential to improve or control the quality of such foods. Newer foods and food processes may depend on the use of microorganisms, the production of "single cell" protein and fermented foods being typical examples. Additiionally, the use of microorganisms for the utilization of food processing waste and the greatly the food industry on economic grounds and the community at large on ecological grounds.

An application of mictobiology is therefore essential to food technologist if they are to control or exploit the natural metabolic to the community.

CONTENTS: Theory

Sl. No.	Name of the Topics	Hours	Marks
1	INTRODUCTION 1.1 History of microbiology, microorganisms and men (Marks-4) 1.2 Classification of microorganisms : Bacteria, Yeast, Fungi, Algae, Protozoa, Viruses (Mark-10)	10	14
2.	CULTURE METHODS 2.1 Methods of isolation of pure culture, Culture maintenance media (Mark-10) 2.2 Techniques of culturing, asepsis (Mark-6)	10	16
3.	MICROSCOPY 3.1 Microscope, methods of microscopic examination (Mark-5) 3.2 Staining techniques (Mark-5)	05	10
4.	MORPHOLOGY 4.1 Morphological and cultural characteristics of bacteria and fungi (Mark-5) 4.2 Vegetative cells, spores, motility (Mark-5)	05	10
5.	PHYSIOLOGY 5.1 Physiology of microorganisms (Mark-5) 5.2 Autotrophs & Heterotrophs, chemosynthetic, saprophytes & parasites, Aerobes & Anaerobes, microaerophilic, psychrophiles, mesophiles and thermophiles. (Mark-10)	15	15
6.	GROWTH & INHIBITION 6.1 Factors affecting growth and death, Cell division, Budding, Sporulation, Fragmentation (Mark-4) 6.2 Growth optima, Phases of growth (Mark-6) 6.3 Explain control of Microbial spoilage by	15	15

	various food preservation methods(Low temperature, high temperature, irradiation, dehydration, chemicals) in fruit & vegetables. (Mark-5)		
	Total	60	80

Reference Books :

1. Food Microbiology , W.C.Frazier & D.C.Westhoff ,TMH, New York
2. Modern Food Microbiology , James Jay ,CBS, New Delhi
3. Basic Food Microbiology. – G. J. Banwart.

FUNDAMENTALS OF MICROBIOLOGY LABORATORY

L *T* *P*
0 *0* *4*

Curri. Ref. No. : FT-304

Total Contact hrs. : 60

Total Marks : 50

Practical Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 60

Content
1.0 Study of Microscope and their parts.
2.0 Straining of Bacteria and observe size , motility,metachromatic granulars and spores.
3.0 Morphology of Bacteria , moulds, yeasts
4.0 Prepare nutritient growth and media with agar, gelatin and special media for culture of microbes.
5.0 Sterilisation of glassware and media.
6.0 Isolate pure culture from water, milk,. Fruit juice, fish, meat etc.
7.0 Determine bacterial species .
8.0 Determine thermal death time.
9.0 Methalyene blue reduction test.
10.0 Bacterological examination of water and milk.

FOOD ENGINEERING

L T P
3 1 0

Curri. Ref. No. :FT-305

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

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.

CONTENTS: Theory

Sl. No.	Name of the Topics	Hours	Marks
1	Introduction 1.1 General introduction to food technology 1.2 Explain principles of food preservation 1.3 Explain methods of food preservation	10	14
2.	Preservation and Processing by heat 2.1 Effect of Heat on Microorganisms 2.2 Thermal Death Time (TDT) Curve 2.3 Environmental factors 2.4 Canning 2.5 Pasteurization	10	16
3.	Preservation and Processing by Cold 3.1 Effect of cold on micro-organism 3.2 Types of cold preservation	10	10
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	10	10
5.	Fermentation 5.1 Benefits of fermentation 5.2 Microbial activities in foods	08	10

	5.3 Control of fermentation in foods		
6.	Food irradiation 6.1 Kinds of ionising radiations 6.2 Mode of action of radiations 6.3 uses of radiations	07	10
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	05	10

Reference Books :

1. Food Science- N. N Potter, CBS Publication
2. Principles of food science II Volumes- Karel and Luno Marcel Defker
3. Principles of food science. –Fannema, CBS Publication
4. Principles of food Preservation – Moris, Chapman & Hall
5. Food Analysis – R. Lees, C. R. C. Press Inc

FOOD ENGINEERING LABORATORY

L *T* *P*
0 *0* *4*

Curri. Ref. No. :FT- 305

Total Contact hrs. : 60

Total Marks : 50

Practical Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 60

Content
1.0 Study and operation of bottle washing machine.
2.0 Testing of can and study and operation of can sealing machine.
3.0 study and operation of can reformer.
4.0 Extract tomato juice ,using pulper and prepare tomato products and preserve.
5.0 Extract pineapple juice ,using hydraulic press and prepare their products and preserve.
6.0 Preserve fruits and vegetables by canning.
7.0 Dehydrate fruits and vegetables .
8.0 Prepare and preserve different juice.
9.0 Prepare citric acid by fermentation.
10.0 Extract and refine oil from oil seeds.

BRANCH : FOOD TECHNOLOGY
Semester: IV

Sl No	Subject	Teaching scheme (hours/work)			Evaluation Scheme					Total mark
		L	T	P	Theory			Practical		
					End Exam	Internal Assessment		End Exam	Session I	
						Class Test	Assignment			
1.	Fundamentals of Bio-Chemistry & Nutr	4	1	3	80	15	5	25	25	150
2.	Fruits & Vegetable Technology	4	1	3	80	15	5	25	25	150
3.	Cereal Technology	4	1	3	80	15	5	25	25	100
4.	Food Process Engg.-I	4	1	3	80	15	5	25	25	150
5.	Technical Seminar			3					50	50
6.	Industry Visit & Project			4					100	100
	Total	16	4	19	320	60	20	100	250	750

FUNDAMENTALS OF BIOCHEMISTRY & NUTRITION

L T P
4 1 4

Curri. Ref. No. : FT-401

Total Contact hrs. : 75

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 75

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Rationale :

Biochemistry has its roots in fermentation , Nutrition , Agriculture , Medicine and Natural products. Today, it is principally concerned with the chemistry of molecules found in and associated with living system especially the chemistry of the interaction of this molecules. Developing this understanding has required the careful application of physical & chemical laws and methods in combination with the careful biological manipulation of the system under study. Several modern biochemical approaches take advantage of technology advances to study intact system.

Topics	Hours	Marks
1.0 Carbohydrate 1.1 Define carbohydrate 1.2 Define nomenclature 1.3 Explain classification and general properties of sugar(physical and chemical) 1.4 State physiological functions of carbohydrates	10	10
2.0 Proteins 2.1 Define Proteins 2.2 Define Amino Acid sequence in proteins 2.3 Define Physical and Chemical Properties of amino acids and proteins 2.4 Define food protein and their characteristics	08	10
3.0 Lipids 3.1 Define lipids and fatty acids 3.2 Define essential fatty acids, fat and oil and uses 3.3 State specification number, acid number, iodine value, acetyl value, reichert-meissl number 3.4 Hydrolytic and oxidative rancidity, preservation of rancidity, reversion	08	10
4.0 Vitamins 4.1 Define Vitamins	08	10

4.2 Occurrence, Chemistry, Classification 4.3 Deficiency diseases and high intakes		
5.0 Enzymes 5.1 Classification and nomenclature, properties, mechanism of enzyme action 5.2 Enzymes and coenzymes, effect of temperature, PH, enzyme concentration and substrate concentration on the rate of enzyme reaction. 5.3 State specificity of enzyme, enzyme inhibition, kinetics of enzyme action, activation of enzymes and iso enzyme. 5.4 State the functions of enzymes involved in digestion.	07	10
6.0 Metabolism of Carbohydrates 6.1 State and explain Embeclen meyerhoff pathway 6.2 State and explain Kerb's Cycle 6.3 Oxydative Phosphorylation and energy balance 6.4 Glycogenesis, Glycogenolysis, Gluconeogenesis	07	10
7.0 Metabolism of lipids 7.1 Explain digestion and absorption of lipids	07	05
8.0 Metabolism of proteins 8.1 Explain amino acid an nitrogen pool, nitrogen balance 8.2 Explain essential amino acids 8.3 Evaluate quality of proteins 8.4 Study general metabolism of proteins and amino acids.	07	05
9.0 Minerals 9.1 Macronutrients 9.2 Micronutrients	05	05
10.0 Introduction to human nutrition 10.1 State the functions of food. 10.2 Define basic food groups. 10.3 Study basal energy metabolism. 10.4 Explain fuel value of foods. 10.5 Explain dietary allowances & standards for different age groups. 10.6 Explain balance diets. 10.7 Explain nutritive value of foods. 10.8 Explain Dietary interrelationship of nutrients.	08	05

Reference Books :

1. Hand Book of Biochemistry- M.A.Siddiqi & A.Q. Siddiqi, Unique offset Press, Patna
2. Text Book of Biochemistry- A.Lehninger
3. Outlines of Biochemistry- Eric E. Con

FUNDAMENTALS OF BIOCHEMISTRY & NUTRITION LABORATORY

L *T* *P*
0 *0* *3*

Curri. Ref. No. :FT- 401

Total Contact hrs. : 45

Total Marks : 50

Practical Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

Sl.No.	Name of Experiment	No.of perids
1	Study of Bio- physical concept of Acids & Bases , PH & buffer etc.	03
2	Errors & Acuracy in analysis of food materials; sampling	03
3	Determine KM of enzymes.	03
4	Determine V max of enzymes.	03
5	Detect & estimate amino acids & carotenoids by paper chromatography & column chromatography	06
6	Estimate of papains	03
7	Detect starch in food grains.	03
8	Calculate nutritive value of common food preparation.	06
9	Determine calorific value of food.	03
10	Determine nutritive value of foods through analysis of proximate principles.	06
11	Determine vitamins & minerals from food samples such as Ca, Fe,P,Cu,Pb,Ar,Sn,ascorbic acid,thiamin,riboflavin,vitamin-A,Caroten	06

FRUITS AND VEGETABLE TECHNOLOGY

L T P
4 1 3

Curri. Ref. No. : FT-402

Total Contact hrs. : 75

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 75

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

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.

Topics	Hours	Marks
1.0 Physiology 1.1 Study physical and chemical treatment to increase post herbal life 1.2 Study about transpiration, respiration, ripening and their effects 1.3 Use of plant growth regulations 1.4 Use of ethylene and its mechanism	10	15
2.0 Storage of fresh fruits and vegetables 2.1 Study the microbiology of fresh fruits and vegetables 2.2 Study spoilage and its control 2.3 Study the principles and methods of storage-cold storage, atmosphere storage, gas storage, hypobaric storage, pre-cooling, radiation, waving etc	10	10
3.0 Processing 3.1 Study the processing of vegetables: Potato chips, French fries, frozen patties, sweet potato chips, flakes, <i>Tomato</i> -juice, puree, sauce, ketchup, chutney. <i>Mushroom</i> -freeze drying, pickles, dehydration 3.2 Study the processing of fruits: Jam, Jelly, squash, marmalade, pickles, vinegar	10	10

3.3 Study concentration of fruit and vegetable juice 3.4 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	10	08
5.0 Fermented fruit and vegetable products 5.1 Explain Fermented foods 5.2 Explain pickling and curing of foods	10	10
6.0 Intermediate moisture foods 6.1 Study coconut and its derivatives 6.2 Study the By-Product and their utilization	10	10
7.0 Preparation of spice powder and condiment products 7.1 Prepare spice powder and condiment products	10	07
8.0 Preparation of non-alcoholic beverage 8.1 Prepare tea, coffee, and cocoa and their products	05	10

Reference Books :

1. Preservation of fruits & vegetables- Giridhari Lal, ICAR, Publication
2. Processing of fruits & vegetables- Sidappa
3. Commercial fruits & vegetables processing – Wudruff & Luh, AVI, Publication

**FRUITS AND VEGETABLE TECHNOLOGY
LABORATORY**

L T P
0 0 3

Curri. Ref. No. :FT- 402

Total Contact hrs. : 45

Total Marks : 50

Practical Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

Sl.No.	Name of Experiment	No.of perids
1	Study of cold storage of fruits & vegetables.	03
2	Prepare and preserve of fruits & vegetables juice.	03
3	Prepare concentration of of fruits & vegetables juice.	03
4	Prepare jam, jelly ,pickles, chutney, Vinegar, tomato products, marmalde	09
5	Study and demonstrate the freezing and dehydration of fruits and vegetables.	03
6	Prepare intermediate fast food.	03

7	Prepare fermented food (fruits and vegetable product)	09
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.	06

CEREAL TECHNOLOGY

L T P
4 1 3

Curri. Ref. No. : FT-403

Total Contact hrs. : 75

Total Marks : 100

Theory : 75

Practical : Nil

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

I.A. : 15 Marks

Assignment : 05 Marks

Objective

India is a most populated country with rich in production of cereal grains. The processing of cereal grains is necessary to reach the needy. The student after completion of know details of the technology of milling , processing, production of bakery and confectionary products.

Content	Hours	Marks
1.0Introduction 1.1 Study major cereals in India 1.2 Study nutritive value of cereals	05	10
2.0Structure 2.1 Study structure, varieties and classification of cereal	10	10

grain such as rice, wheat, sorghum, ragi, corn, barley, bajra etc		
3.0 Milling of cereal grains 3.1 Study cleaning, dehusking, polishing, grading, glazing, rice parboiling of rice milling 3.2 Study wheat roller milling 3.3 Study milling coarse grains and maize milling 3.4 Study nutritive value losses during milling and minimization of such losses	10	10
4.0 Corn and barley products 4.1 Study dry milling of corn into grits, coarse meal and flour 4.2 Study wet milling of corn into starch, gluten, germ oil, cake, corn steep liquor, yellow and white dextrin, corn syrup, dextrose powder and high fructose corn syrup 4.3 Study milling of barley, malting, production of syrup, alcohol, beer etc.	10	10
5.0 Storage 5.1 Study storage of cereals and milled products	10	05
6.0 Technology of bakery products 6.1 Study the function of different ingredients for production of bread, cake, biscuits 6.2 Study mixing, dough development, sheeting, rounding, proofing, fermentation, baking of bread 6.3 Study mixing and baking of cake 6.4 Study mixing, sheeting, baking of biscuit	10	10
7.0 Technology of confectionery products 7.1 Study production of confectionery products	10	10
8.0 Snacks food processing 8.1 Study recent trends in snack food processing 8.2 Study production of extruded cereal foods 8.3 Study production of break fast cereal foods 8.4 Study production of cereal based baby foods 8.5 Study other possible utilization of cereals in other processed foods, convenience foods	10	15

BOOKS RECOMMENDED

Sl No	Author	Title	Publication
1	Kent	Tech. of cereals and cereal products	
2	Matz	Bakery technology and Engg	AVI
3	W. J. Fance	Bread making and flour confectionery	AVI

CEREAL TECHNOLOGY- PRACTICAL

L *T* *P*
0 0 3

Curri. Ref. No. : FT-403

Total Contact hrs. : 45

Total Marks : 50

Practical Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

1. Study and identification of different grains
2. Determine moisture content of different grains
3. Demonstrate rice parboiling
4. Demonstrate milling of cereals
5. Prepare bread , cake, biscuits
6. Prepare cereal based baby and infant foods
7. Dough test of wheat flour
8. Qualitative test for wheat flour and baking
9. Visit to wheat flour mill and rice mill
10. Visit to baking industries and corn processing plants

FOOD PROCESS ENGINEERING-I

L *T* *P*
4 1 3

Curri. Ref. No. : FT-404

Total Contact hrs. : 75

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 75

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

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.

Content	Hours	Marks
1.0 Introduction 1.1 Study Engineering aspect of different types of sterilizers, pasteurizers, evaporators, concentrators in food industry	10	15
2.0 Canning 2.1 Evaluate process time in canning by different methods 2.2 Study of canning machine and other accessories used in canning industry	15	15
3.0 Cold Storage 3.1 Study and construction of cold storage 3.2 Study different types of freezers (plate freezers, blast freezers, cryogenic freezing, vacuum freezing, refrigerated vans and wagons)	10	15
4.0 Dryers 4.1 Study engineering aspect of different dryers (roller dryer, spray dryer, fluidized bed dryer, freeze dryer, solar dryer etc)	15	15
5.0 Grading and sizing 5.1 Study the equipments used for grading and sizing of food in industry. 5.2 Study extruders and emulsifiers. 5.3 Study different equipments used for processing of food.	10	05
6.0 Food packaging 6.1 Introduction to Food packaging 6.2 Importance and function of food packaging. 6.3 Study types of rigid and flexible packaging 6.4 Study the properties, manufacturing, merits, demerits, product compatibility of paper, paper board, cellophane, plastic bags and pouches, tin containers, fiber boards, glass containers etc 6.5 Study the packaging materials required for fresh fruits and vegetables, frozen foods, cereals, bakery, meat and meat products.	15	15

BOOKS RECOMMENDED

Sl No	Author	Title	Publication
1	S. E. Charm	Fundamentals of Food Engineering	AVI
2	J. C. Harper	Elements of Food Engineering	AVI
3	Saccharo & Griffin	Packaging Technology	AVI

FOOD PROCESS ENGINEERING-I PRACTICAL

L *T* *P*
0 *0* *3*

Curri. Ref. No. : FT-404

*Total Contact hrs. :
45*

Total Marks : 50

*Practical Exam. : 4 hrs.
End Exam. : 25 Marks*

Theory : Nil

Sessional : 25 Marks

Practical : 45

Content
1.0 Drying of different types of food materials
2.0 Preservation of meat and fish by canning
3.0 Freeze drying; freezing of fish and meat
4.0 Evaluation of F & Z values of two types of micro organisms encountered in spoilage of canned food
5.0 Determination of process time by graphical and formula method
6.0 Measurement of thickness, grammage of of different packing materials
7.0 Identification of different packaging materials and their properties and their uses
8.0 Self-life study of packaged foods
9.0 Evaluation of packaging materials for water vapor storage studies.

10.0 Quality assessment of processed food

BRANCH : FOOD TECHNOLOGY
Semester: V

Sl No.	Subject	Teaching scheme (hours/work)			End Exam	Evaluation Scheme				Total mark
		L	T	P		Theory Internal Assessment Class Test	Assignmen t	Practi cal	Session I	
	Theory & Practical									
1.	Fluid Mechanics & Heat Transfer	3	1	6	80	15	5	25	25	150
2.	Food Processing Engineering-II	3	1	3	80	15	5	25	25	150
3.	Dairy Technology	3	1	3	80	15	5	25	25	100
4.	Meat & Poultry Technology	3	1	3	80	15	5	25	25	150
5.	Fish Processing Technology	3	1	0	80	15	5	-		150

6	Technical Seminar					2					50
7	Library study					2					
	Total	15	5	19	400	75	25	100	150		750

FLUID MECHANICS & HEAT TRANSFER

L T P
3 1 0

Curri. Ref. No. : FT-501

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Rationale :

Besides the use of solids, an important engineering material numerous are the examples of use/application and handling of fluids (e.g. both liquids and gases) in wide spectrum of engineering practice. Fluid statics, fluid flow phenomena, flow measurement, fluid flow through pipe lines, fluidized bed etc. in an industry are essentially important. There are many unit processes particularly in chemical, petrochemical, pharmaceutical, hydro-metallurgical etc. plants in which fluid flow phenomena are of fundamental importance in design consideration. It is therefore, necessary for an engineer planning career in

chemical, petrochemical etc. industries to study fluid flow phenomena, selection of the characteristics of different fluid transportation and flow control devices.

Objectives : On completion of studies of fluid mechanics the student will be able to

- (i) Distinguish the fundamental and derived units, derived dimensional formula of various physical quantities
- (ii) Understand and explain between fluid statics and fluid dynamics
- (iii) Solve problems on flow measurement, Bernoulli's equation etc.
- (iv) Acquaint themselves with various kinds of pumps, blowers & fans
- (v) Understand various fluid properties like density, viscosity and critical velocity, Reynolds number etc.
- (vi) Acquire problem solving skill and improvisation of the process.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	INTRODUCTION TO FLUID STATICS	10	10
2.	FLUID FLOW PHENOMENA AND FLUIDISATION	10	20
3.	FLOW MEASUREMENT AND TRANSPORTATION OF FLUID	10	20
4.	CONDUCTION	10	10
5.	CONVECTION	10	10
6.	HEAT EXCHANGERS AND EVAPORATORS	10	10
	TOTAL	60	80

1.0 INTRODUCTION TO FLUID STATICS

- 1.1 Define and classify fluid
- 1.2 Describe the properties of fluid
- 1.3 State and explain Newton's Law of viscosity
- 1.4 Differentiate Newtonian & Non-Newtonian fluid

1.5 Derive an equation of pressure head.

2.0 FLUID FLOW PHENOMENA AND FLUIDISATION

2.1 Describe types of flow

2.2. Explain Reynolds's experiment

2.3 Describe mechanism of fluid flow in pipes

2.4 Derived Bernoulli's theorem and solve simple problems

2.5 Explain friction factor and estimate friction loss in pipes

2.6 Define and classify fluidisation

2.7 Derive a pressure drop equation in fluidised bed.

2.8 Describe the fluid flow characteristic in packed bed.

3.0 FLOW MEASUREMENT AND TRANSPORTATION OF FLUID

3.1 Flow measurement and Transportation of fluid.

3.2 Explain fluid flow through orifice meter, venturi meter and derive an expression for flow measurement, solve simple problems on it.

3.3 Describe the construction and working of rotameter.

3.4 Differentiate pipe and tube.

3.5 Identify and explain standard pipe fittings

3.6 Explain the construction and operation of different types of valves.

3.7 Classify pumps.

3.8 Explain the construction and operation of centrifugal pump.

4.0 CONDUCTION

4.1 Describe heat low concept in conduction.

4.2 Explain steady state and unsteady state conduction.

4.3 State and explain Fourier's law of conduction.

4.4 Derive an equation of heat flow in a composite wall and a cylinder.

4.5 Define optimum thickness of insulation.

4.6 Solve problems on conduction.

5.0 CONVECTION

5.1 Define and classify convection

5.2 Explain heat flow phenomenon in convection

5.3 Derive equation of individual and overall heat transfer co-efficient.

5.4 Explain different dimensionless no. used in convection and discuss different empirical equation on heat flow by convection.

5.5 Define and explain parallel, co-current and counter current flow.

5.6 Derive log mean temperature difference.

6.0 HEAT EXCHANGERS AND EVAPORATORS

6.1 Define and classify heat exchanger.

- 6.2 Explain the construction and working of single pass, and multipass, shell and tube heat exchangers.
- 6.3 Derive energy balance for shell and tube heat exchanger and solve problems.
- 6.4 Classify evaporator
- 6.5 Explain construction and operation of different types of evaporators
- 6.6 Solve simple material balance and energy balance problems

Reference Books :

- 1. 'Unit operation for Chemical Engineers' – Macabale & J.M.Smith (McGraw-Hill)
- 2. Introduction to Chemical Engineering by Badgero and Banchemo (McGraw-Hill)
- 3. Introduction of Chemical Engg. by Ghosh, Sanyal and Dutta (Tata McGraw-Hill)
- 4. Chemical Engineering Vol.II – Richardson & Coulson.

FLUID MECHANICS AND HEAT TRANSFER LABORATORY

L *T* *P*
0 *0* *6*

Curri. Ref. No. : FT-501

Total Contact hrs. : 90

Total Marks : 50

Theory Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical :90

List of experiments :

Sr. No.	Name of experiment
1	Demonstrate operation of Reynolds's apparatus and find out critical velocity
2	Verify Bernoullis equation
3	Demonstrate operation of venturi meter and determine the venturi co-efficient
4	Demonstrate operation of Orifice meter and determine the Orifice co-efficient
5	Demonstrate operation of a Rotameter and determine rate of flow through Rotameter
6	Demonstrate operation of a centrifugal pump and valves
7	Demonstrate operation of a fluidized bed column packed bed column
8	Demonstrate heat ltransfer through composite wall and find the resistance of wall
9	Demonstrate operation of multi pass, horizontal hear exchanger and determine H & U
10	Deminstrate heat transfer in forced convection and determine h

FOOD PROCESSING ENGINEERING-II

L T P
3 1 0

Curri. Ref. No. : FT-502

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Objective

The food technologist who will work in a food processing plant must have the knowledge of the filteratin, mixing, extraction, distillation, crystallization etc. The details of all these found in the syllabus so that they will not face any major problem while working as engineer.

Content	Hours	Marks
1.0 Size reduction 1.1 Define objects of size reduction 1.2 State and explain classification of crushers(course, intermediate, fine) 1.3 Explain details of construction and operation 1.4 State and Explain Kick's law and Rittinger's law 1.5 Define close and open circuit 1.6 Explain grinding(wet and dry) 1.7 Solve simple problems on Kick's law and Rittinger's law	10	10
2.0 Size separation 2.1 Explain screening 2.2 Explain air filter and air separation 2.3 Explain membrane separation 2.4 Explain separation of immiscible liquids 2.5 Study sedimentation equipments(froth flotation) 2.6 Explain setting classifiers 2.7 Explain hydraulic classifiers 2.8 Explain magnetic and electrostatic separators 2.9 Explain cycloma separators 2.10 Explain gravity separators	10	10
3.0 Filtration 3.1 Study and Explain the classification of equipments 3.2 Study the theory of filtration(no derivation and problems) 3.3 Explain types of filtration 3.4 Explain rotary vacuum filter 3.5 Explain centrifugal classification and filtration	10	10

4.0 Mixing 4.1 Explain object of mixing 4.2 Study the equipments for mixing of solids, liquids and gases for one another 4.3 Explain choice of mixers(centrifuge, batch and continuous)	05	05
5.0 Extraction 5.1 Explain principles of extraction 5.2 Explain types of Extraction(solid-liquid extraction, liquid extraction) 5.3 Study the types of equipments for extraction	10	15
6.0 Material handling 6.1 Study conveying equipments(belt, bucket and screw conveyor) 6.2 Study elevating and pneumatic equipments	05	05
7.0 Distillation 7.1 Explain types of distillation(flash, steam and differential) 7.2 Study the types of equipments for distillation	10	10
8.0 Crystallization 8.1 Explain types of crystallization(batch, continuous) 8.2 Explain Principles of crystallization	10	10
9.0 Drying 9.1 Study the types of dryers	05	05

BOOKS RECOMMENDED

- | | |
|------------------------------------|-------------------|
| 1. Introduction to Chemical Engg | Badger & Banchero |
| 2. Unit operation in Chemical Engg | Mccabe & Smith |

FOOD PROCESSING ENGINEERING-II PRACTICAL

L T P
0 0 3

Curri. Ref. No. : FT-502

Total Contact hrs. : 45

Total Marks : 50

Theory Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

Content
1.0 Study and operation of ball mill
2.0 Study and operation of a mechanically/manually operated sieve-shaker; Particle size measurement by screen analysis of a ground product
3.0 Study and operation of a froth flotation cell; concentration froth flotation
4.0 Study and operation of a wilfey table
5.0 Study and operation of a cyclone separator and electrostatic separator
6.0 Study and operation of a plate and frame filter press; determination of rate of filtration under different pressures
7.0 Study and operation of a centrifuge
8.0 Study and operation of a thickener
9.0 Study and operation of a vacuum tray dryer; determination of drying rate under constant drying condition and plotting graph of falling rate period
10.0 Study and operation of a vacuum drum dryer
11.0 Study and operation of a humidifier; determination of humidity by dry and wet bulb thermometer from psychometric chart
12.0 Study and operation of a refrigerator deepfreezer

DAIRY TECHNOLOGY

L T P
3 1 0

Curri. Ref. No. : FT-503

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05

Marks

Objective

Dairy technology is also known as the milk and milk products technology. Milk is the vital element, which contains a lot of vitamins. Some people do not like to drink milk but like milk products. The students of food technology after completion of study have the basic idea of milk and the production of milk products, to help those people who do not like milk. They also study the fermented milk products and infant milk food for the babies.

Content	Hours	Marks
1.0 Introduction 1.1 Study the objective and development of milk processing industries in india 1.2 Study the present status and future scope	02	04
2.0 Secretion 2.1 Explain theories of milk secretion 2.2 Explain the function of hormones and their influence on milk secretion 2.3 Explain hygenic milk production	08	12
3.0 Constitution and composition of milk 3.1 Explain major and minor constituents of milk 3.2 Explain phisico-chemical properties of liquid milk 3.3 Explain the factors effecting composition of milk 3.4 Study the nutritive value milk and milk products 3.5 Explain the microorganisms associated with milk and milk spoilage	08	12
4.0 Processing, distribution and storage of liquid milk 4.1 Explain processing of milk-Straining, filtration, clarification, cream separation 4.2 Explain heat treatment of milk- boiling, pasteurization, homogenization 4.3 Explain the standardization of milk 4.4 Explain the process for preparation of butter, ghee,	13	16

condensed milk, evaporated milk, dried milk, ice-cream		
5.0 Technology of indigenous milk products 5.1 Technology of khoa, rabri, kheer, lassie, pannier, channa, dahi 5.2 Technology of cheese	13	16
6.0 Fermented milk products 6.1 Manufacturing method of cheddar, cottage, processed Swiss, Roquefort, camembert cheese 6.2 Physical, chemical and microbiological changes 6.3 Fortification of milk products	08	10
7.0 Production of infant milk food	08	10

BOOKS RECOMMENDED

Sl No	Author	Title	Publication
1	Eckles, Combs	Milk & Milk Products	THM
2	DE	Out lines of Dairy Tech	Oxford
3	Atherton & Newlander	Chemistry & testing of diary products	CBS

DAIRY TECHNOLOGY-PRACTICAL

L T P
0 0 3

Curri. Ref. No. : FT-503

Total Contact hrs. : 45

Total Marks : 50

Theory Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

Content
1.0 Physical Examination of milk and sampling
1.0 Analysis of milk for water, fat, solids, acidity, specific gravity, freezing point, viscosity and electrical conductivity (a) Methylene blue reductase test (b) Gerber's fat test (c) Solid non-fat test
3.0 Pasteurization of milk
4.0 Homogenization of milk
5.0 Production of following milk products (a) Condensed milk (b) Evaporated milk (c) Dried milk (d) Cream (e) Butter (f) Ghee (g) Ice-cream (h) Flavored and chocolate milk
7.0 Preparation of indigenous milk products
8.0 Visit to milk supply scheme and milk processing industry.

MEAT AND POULTRY TECHNOLOGY

L T P
3 1 0

Curri. Ref. No. : FT-504

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05

Marks

Content	Hours	Marks
1.0 Introduction 1.1 Study the development of meat and poultry industries in india 1.2 Study their role in national economy	05	05
2.0 Plant layout and slaughtering 2.1 Study location, layout and structure of a slaughter house and poultry processing plant 2.2 Study pre-slaughter care, anti and post marte m inspection and kinds of animal/poultry slaughter 2.3 Study of slaughtering and dressing of animal/poultry meats 2.4 Classify meat(wholesale, retail, special cuts)	15	15
3.0 Quality of fresh meat 3.1 Study the factors affecting quality 3.2 Study the criteria to assess quality 3.3 Study the food value and chemical composition of meat 3.4 Study the bio-chemical changes in meat after slaughter leading to rigor mortis, aging, and tenderisation of meat 3.5 Meat additives and adulterants 3.6 Meat Products	15	15
4.0 Egg 4.1 Structure and composition 4.2 Egg quality 4.3 Egg Processing 4.4 Effect of heat on egg proteins 4.5 Egg foams 4.6 Egg Products	10	15
5.0 Poultry 5.1 Classification 5.2 Poultry Processing 5.3 Composition and nutritive value	08	15

5.4 Poultry cocking		
6.0 Spoilage and preservation 6.1 Study contamination, spoilage in general 6.2 Study method of preservation of meat and poultry products (low temp, high temp, curing, smoking, antibiotics, radiation etc)	07	15

BOOKS RECOMMENDED

2. Mauntney-Poultry Products Tech, AVI
3. Lavie –Meat hand book,AVI

MEAT AND POULTRY TECHNOLOGY PRACTICAL

L *T* *P*
0 *0* *3*

Curri. Ref. No. : FT-504

Total Contact hrs. : 45

Total Marks : 50

Theory Exam. : 4 hrs.

End Exam. : 25 Marks

Theory : Nil

Sessional : 25 Marks

Practical : 45

Content
1.0 Visit city slaughterhouse and city market.
2.0 slaughtering and dressing of meat poultry bud.
3.0 Identify the parts of meat / poultry
4.0 Study of processing of meat (curing)
5.0 Prepare sausage and ham
6.0 Microbial Examination and chemical composition of meat.
7.0 Asses egg quality
8.0 Prepare meat products

FISH PROCESSING TECHNOLOGY

L *T* *P*
3 1 0

Curri. Ref. No. : FT-505

Total Contact hrs. : 60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Content	Hours	Marks
1.0 World Production of fish, Indian production and production in the state	02	05
2.0 Consideration of fish as food; assessment of quality of fish	02	05
3.0 Pisciculture and breeding	05	10
4.0 Method of fish catching and handling on the quality of fish	03	05
5.0 Preservation of fish by different method	04	10
6.0 Manufacture of fish protein, concentrates, fish sauces, and fish sausage	03	10
7.0 Production of fish meat, fish oil, fish liver oil etc	05	10
8.0 Quality aspects of processed fish	03	10
9.0 Microbiological examination of fish	06	10
10.0 Dressing of fishes	04	05
11.0 Freezing of meat of fishes	04	05

BRANCH : FOOD TECHNOLOGY
Semester: VI

Sl No .	Subject	Teaching scheme (hours/work)			Evaluation Scheme					Total mark
		L	T	P	Theory			Practical		
	End Exam				Internal Class Test	Assessment Assignment	Practi cal	Session al		
									Theory & Practical	
1.	Entrepreneurship & Industrial Management	4	1	0	80	15	5	-	-	100
2.	Environmental Engg. & Pollution Control	4	1	6	80	15	5	50	50	200
3.	Instrumentation & Process Control	4	1	6	80	15	5	50	50	200
4.	Food Hygiene, Sanitation & Quality Control	3	1		80	15	5			100
5.	Project work & Seminar			8				100	50	150
	Total	15	4	20	320	60	20	200	150	750

Entrepreneurship & Industrial Management

L T P
4 1 0

Curri. Ref. No. : FT-601

Total Contact hrs. : 75 Total Marks : 100

Theory : 75

Practical : Nil

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

I.A. : 15 Marks

Assignment : 05 Marks

Rationale:

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment. Management functions, in an organization, coordinate various resources to allow the manufacturing activities to continue on a sustained basis. It is essential that the diploma engineers are given an exposure to such management principles, so that they are capable to manage various industrial activities.

Various statutory rules acts and regulations have been instituted in India by Central/State Govt. to ensure that the workmen are not exploited and they can earn their livelihood with respect. As a supervisor/manager has to work in an industry under binding of such rules and acts, they should have a fair idea of such rules/acts/regulations.

Objectives:

On completion of course the students will able to

1. Understand the concept of different forms of organization & Management function.
2. Explain the role of an entrepreneur in industrial environment & detailed idea on SSI and various related aspects.
3. Learn about financial accounting and cost control.
4. Know the different area of management relating the stores & finance, production, sales & marketing and human resource in the organization.
5. Understand about the industrial sickness & its remedies.
6. Have a comprehensive idea on some important legislations relating to factory, workmen's compensation, payment of wages, industrial disputes and trade union.

COURSE CONTENT

1.0 CONCEPT OF ORGANISATION & ENTERPRISE MANAGEMENT

- 1.1 Define & state the features of Business.
- 1.2 Explain the components of Business.
- 1.3 State the feature of different forms of Business organization.
- 1.4 Define Management & different Management with Administration.
- 1.5 Discuss the functions of Management.
- 1.6 Discuss the principles of 'Scientific Management'
- 1.7 Explain organization structure and delegation of authority & responsibility
- 1.8 State the principles of a sound organization.

2.0 ENTREPRENEURSHIP & MANAGEMENT OF S.S.I.s

- 2.1 Define and state the meaning of 'Entrepreneurship'.
- 2.2 Discuss the entrepreneurial characteristics.
- 2.3 Explain the role of an entrepreneur in industrial development.
- 2.4 Define S.S.I , Ancillary , Tiny , Cottage , Medium ,& large Scale Industries.
- 2.5 Explain the features of SSI.
- 2.6 Discuss the criteria for selection of SSI.
- 2.7 Prepare a preliminary & detailed project report of a SSI.
- 2.8 Enumerate the incentives available to SSI as per IPR.
- 2.9 State the inputs required for setting up a SSI.
- 2.10 Discuss the institutional support to SSI at State and National level. (OSFC, OSIC, IPICOL, IDCO, SIDBI, IDBI, ICICI & Commercial Banks)

3.0 FINANCIAL ACCOUNTING AND COST CONTROL

- 3.0 State the different types of Accounts & explain the double entry system of book keeping.
- 3.1 Explain Journal, Ledger, Trial Balance & Cash Book.
- 3.2 Explain the components of Final Account and Balance-Sheet.
- 3.3 Define cost and explain its elements.
- 3.4 Prepare a simple cost sheet.
- 3.5 Explain cost volume-profit relationship & break-even-point.

4.0 STORES & FINANCIAL MANAGEMENT

- 4.1 State the procedures involved in purchasing.
- 4.2 Explain the centralized & decentralized purchasing.
- 4.3 State the meaning of importance of Inventory control.
- 4.4 Explain the different stores records-Bin Card, Stores Ledger & Goods Received Note etc.
- 4.5 State the meaning of importance of Financial Management in context with S.S.I.
- 4.6 Explain the types of capital-Fixed & Working.
- 4.7 Discuss briefly the components of Working Capital Management.

5.0 PRODUCTION MANAGEMENT

- 5.1 State the Importance of production, planning and control.
- 5.2 Discuss the Steps involved in production, planning and control.

6.0 SALES & MARKETING MANAGEMENT

- 6.1 Discuss the importance of sales & marketing management.
- 6.2 Mention & explain different selling methods.
- 6.3 Explain the Product policy briefly
(Types of products, Packaging, Branding, Pricing, Cost plus pricing, Variable pricing policy, Price strategy)
- 6.4 Enumerate the techniques of sales promotion.
- 6.5 Explain Advertising & its media

7.0 HUMAN RESOURCE MANAGEMENT

- 7.1 Mention the different sources of requirement.
- 7.2 Explain the different methods of selection.
- 7.3 Discuss the different training methods.
- 7.4 State the need of performance appraisal.

8.0 INDUSTRIAL SICKNESS

- 8.1 Define & explain the meaning of Industrial sickness.
- 8.2 State the causes of sickness.
- 8.3 Explain the remedial measures to avoid Industrial Sickness.

9.0 THE FACTORIES Act.

- 9.1 State the meaning & objectives of factories act.
- 9.2 Outline the various provisions related to Health , Safety, Welfare, Hours of Work, Holidays, Wage, Employment of Women, Accidents, Diseases, Penalties & Procedures.
- 9.3 Explain the duties of Factory Inspector.

10.0 WORKMAN'S COMPENSATION & PAYMENT OF WAGES Act.

- 10.1 State the rules regarding Workmen's Compensation.
- 10.2 Explain the employees' liability for compensation
- 10.3 State the obligation and rights of Employer
- 10.4 Give the meaning of Payment of wages Act
- 10.5 State different rules for payment of minimum wages.
- 10.6 State the provisions of E.P.F. and E.S.I.

11. INDUSTRIAL DISPUTE ACT

- 11.1 Outline the objects and meaning of Industrial Dispute Act
- 11.2 State the causes of Industrial Dispute
- 11.3 Enumerate the machinery set up for settlement of Industrial Disputes
- 11.4 Explain the measures for prevention of Industrial Disputes.

12. TRADE UNION ACT

- 12.1 State the meaning and function of Trade Union
- 12.2 Explain the features of Trade Union Act 1926

BOOKS RECOMMENDED:

- 1. O.P. Khanna- Industrial Engineering & Management
- 2. Gupta & Srivastava- Entrepreneurial Development
- 3. Vasant Desai – Small Scale Industry
- 4. Sharma & Gupta – Business Organization
- 5. L. M. Prasad – Principles & Practice of Management
- 6. B. Bhadhei - Entrepreneurship for Engineers
- 7. N.D.Kapoor- Industrial Law

ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL

L T P
4 1 0

Curri. Ref. No. : FT-602

Total Contact hrs. : 75 Total Marks : 100

Theory :75

Practical : Nil

Theory Exam. : 3 hrs.
End Exam. : 80 Marks

I.A. : 15 Marks

Assignment : 05 Marks

Rationale:

Due to various aspects of human developments including the demands 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 standard 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 engineering and pollution control is to be learned by every chemical Engineering students in order to control the environment as best as possible.

Objective:

After completion of study of environmental engineering and pollution control, the student will be able to

1. Aware air, water, noise, solid waste management and hazardous waste and their effects.
2. Understand methods of pollution control and their standards.

TOPICWISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods	Marks
1	Introduction	10	09
2	Air Pollution	20	20
3	Water pollution	20	20
4	Solid waste management	10	15
5	Noise Pollution	08	08
6	Hazardous waste management	07	08
	Total	75	80

1.0 INTRODUCTION

- 1.1 Explain the importance of environment for mankind
- 1.2 Describe environmental damages causes due to pollution
- 1.3 State environmental portion acts
- 1.4 Describe functions of state & central pollution control board

2.0 AIR POLLUTION

- 2.1 Explain composition of air
- 2.2 Classify pollutants and their nature
- 2.3. Describe sources of air pollutants
- 2.4 Explain their affects on man kinds
- 2.5 Describe their affects on plants, animal life, material
- 2.6 Specify methods of estimation of pollutants presents in air
- 2.7 Classify and explain air pollution control equipment for particulate emission and gaseous pollutants.
- 2.8 Specify air pollution problems of typical chemical industries like thermal power plant, cement plants.
- 2.9 Describe air quality criteria and standards

3.0 WATER POLLUTION

- 3.1 Explain types, sources and effects of water pollution (Recap)
- 3.2 Describe water pollution by industrial wastes
- 3.3 Specify and explain industrial waster water treatment methods
- 3.4 Describe Preliminary, primary, secondary, tertiary, advance treatment
- 3.5 Describe sludge treatment and disposal
- 3.6 Describe water quality criteria and standards

4.0 SOLID WASTE MANAGEMENT

- 4.1 Classify and explain composition of solid waste
- 4.2 Describe solid waste disposal methods

5.0 NOISE POLLUTION

- 5.1 Define noise
- 5.2 Explain sources of noise
- 5.3 Determine noise pollution level
- 5.4 Describe different methods of noise pollution control

6.0 HAZARDOUS WASTE

6.1 Describe different types of hazardous waste, effect and their disposal methods

Books

- 1 Water supply waste disposal and Env. Pollution Engg. By A. K. Chatterjee
- 2 Air Pollution by M.N. Rao
- 3 Env. Engg. by Raw & Pearvy
- 4 Environmental Chemistry by A.K. De
- 5 Environmental pollution and control in chemical process industry by S.C. Bhatia.

ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL

L T P
0 0 6

Curri. Ref. No. : FT-602

Total Contact hrs. :90

Total Marks: 100

Sessional :50 Marks

End Exam. : 50 Marks

Theory : Nil

Practical: 90

SL. No.	Topic	Periods
1	Collection of sample of waste water	09
2	Analyse a given sample of waste water for estimation of dissolved chloride	09
3	Determine the dissolved oxygen content of water by Winkler's method	09
4	Determine the chemical oxygen demand (BOD) exerted by a given sample of waste water	09
5	Determine the chemical oxygen demand (COD) of a given sample of waste water`	09
6	Determine the turbidity of a given sample of waste water	09
7	Determine the total dissolved solid in a given sample of waste water	09
8	Determine the optimum amount of Coagulant required to treat to turbid water	09
9	Determine the optimum amount of coagulant required to treat to turbid water	09
10	Determine the amount of sulphate in a given sample of water.	09

INSTRUMENTATION AND PROCESS CONTROL

L T P
4 1 0

Curri. Ref. No. : FT-603

Total Contact hrs. : 75 Total Marks : 100

Theory : 75

Practical : Nil

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

I.A. : 15 Marks

Assignment : 05 Marks

Rationale:

Number of control equipment and measuring devices are used in the operation of chemical engineering unit operation equipment to control of process variable, these variables like temperature, pressure, level, viscosity, density, refractive index etc. affect the processing equipment and ultimately affect the product quality. It is necessary to study the principle of operation of process variables measuring devices, so that they may be used either on-line or off line for this purpose.

Objectives:

After completion of study of Instrumentation and Process Control, the student will be able to:

1. Understand working principle, construction, repair and maintenance of measuring instrument and their used to control chemical engineering unit operations and processes.

TOPIC WISE DISTRIBUTION OF PERIODS

SL. No.	Topic	Periods	Marks
1	Instrument	10	10
2	Measurement	10	10
3	Liquid level measurement	10	10
4	PH measurement	10	10
5	Temperature measurement	10	10
6	Pressure measurement	10	10
7	Automatic control	15	20
	Total	75	80

1.0 INSTRUMENT

- 1.1 Define instruments
- 1.2 Explain the functions of instruments
- 1.3 Explain the functional elements of instruments
- 1.4 Explain the characteristics of an instruments

2.0 MEASUREMENTS OF CHARACTERISTICS

- 2.1 Describe measurement of density by liquid level method displacement meter and hydrometer
- 2.2 Describe measurement of viscosity by Red Wood Viscometer, Falling Sphere Viscometer, Continuous Viscometer
- 2.3 Describe the measurement of humidity by hydrometer and psychrometer method
- 2.4 Describe measurement of moisture in paper and textile
- 2.5 Describe measurement of refractive index by refractometer and polarimeter
- 2.6 Describe measurement of gas analysis by gas analyser, thermal conductivity, magnetic susceptibility

3.0 LIQUID LEVEL MEASUREMENT

- 3.1 Explain the direct and indirect measurement liquid level both in open and closed pressure vessels.

4.0 PH & CONDUCTIVITY MEASUREMENT

- 4.1 Describe the measurement of PH
- 4.2. Describe the measurement of electrical conductivity

5.0 TEMPERATURE MEASUREMENT

- 5.1 Name different temperature scales.
- 5.2 List the names of different methods of temperature measurement.
- 5.3 Describe the temperature measurement by liquid in glass thermometer and gas pressure thermometer.
- 5.4 Describe temperature measurement on electrical phenomena – like thermocouple, resistance thermometer, optical pyrometer, radiation pyrometer, photo electric pyrometer.

6.0 PRESSURE MEASUREMENT

- 6.1 Name different methods of measurement of pressure.
- 6.2 Describe pressure measurement by Bourdon tube, Bellows, and Diaphragm
- 6.3 Describe pressure measurement by pirani gauge, Meleod Gauge, ionization gauge.

7.0 AUTOMATIC CONTROL

- 7.1 Define the automatic control system and explain the application with example.
- 7.2 Explain elementary idea about transfer function for a first order system and time constant.
- 7.3 Describe different idea about different types of automatic controllers.

BOOKS

- 1. Industrial Instrumentation – D.P. Eckman
- 2. Instrumentation – S.K. Singh
- 3. Process System Analysis and control – Koppel and Conghnaur
- 4. Fundamentals of Automatic Process control – A. S. Narayan

INSTRUMENTATION AND PROCESS CONTROL

L T P
0 0 6

Curri. Ref. No. : FT-603

Total Contact hrs. : 90

Total Marks: 100

Sessional : 50 Marks

End Exam. : 50 Marks

Theory : Nil

Practical: 90

Sl. No.	Topic	Periods
1	Demonstrate different types of pressure gauges and temperature measuring devices	06
2	Determine pH of a given solution by pH-meter	06
3	Determine the viscosity of an Oil by Red Wood Viscometer at different temperature and plotting a graph between viscosity and temperature	06
4	Determine the concentration of sugar in sugar solution by Polarimeter	06
5	Determine the refractive index of different liquids by Abbe's Refractometer	09
6	Find out the neutralpoint an acid-base system with Conductometric Titration	09
7	Demonstrate operation of a Calorimeter	06
8	Determine of conductivity by Conductivitymeter	09
9	Demonstrate control of a liquid flow system	09
10	Demonstrate function of digital multi-meter	06
11	Demonstrate function of a Solenoid Valve	09
12	Demonstrate Strip chart, XY- recorder	09

FOOD HYGINE, SANITATION AND QUALITY CONTROL

L T P
3 1 0

Curri. Ref. No.FT-604 :

Total Contact hrs. :60

Total Marks : 100

Theory Exam. : 3 hrs.

End Exam. : 80 Marks

Theory : 60

I.A. : 15 Marks

Practical : Nil

Assignment : 05 Marks

Rationale :

On completion of the course a student should have the knowledge of importance of food hygiene and sanitation and their effects on the community. They also know the various quality control methods so that any deterioration to any food products can be detected and steps to be taken to neutralise it.

Sl. No.	Topics	Period	Marks
1	Introduction	05	10
2	General principles of food hygiene	15	20
3	Sanitation	08	15
4	Plant sanitation	07	15
5	Legal aspect of food hygiene and sanitation	10	05
6	Quality control	15	15
		60	80

Chapter-1

1) Introduction

- 1.1 Study the importance of Food Hygiene.
- 1.2 Study the importance of Food Sanitation.
- 1.3 Study the importance of food safety.

Chapter-2

General principles of food hygiene

- 2.1 Study the aseptic processing packaging and storage
- 2.2 Evaluate personal hygiene .
- 2.3 Health checkups, cleanliness measures and their implementation.
- 2.4 Food handling habits.

Chapter-3

Sanitation

- 3.1 Define sanitation and terminology related to sanitation viz. sanitary processes, sanitary food etc..
- 3.2 Study sanitary aspect of water supply, source and quality of water in use for industry..

- 3.3 Define purification and disinfections of water.
- 3.4 Study the preventing contamination of portable water supply..

Chapter-4

4 Plant sanitation

- 4.1 Study the importance of cleaning, physical, chemical factors in cleaning, washing sanitation..
- 4.2 Study the sanitizers commonly used and their properties.
- 4.3 Study the sanitization of equipments.
- 4.4 Study the steam sanitization for closed system.

Chapter-5

Legal aspect of food hygiene and sanitation

- 5. Study planning,layout and sanitation in fruits and vegetable processing industry, dairy, meat & poultry, cereal and bakery industry.

Chapter-6

Quality control

- 6.1 Define quality and quality related terminology.
- 6.2 Study the importance of quality control.
- 6.3 Study the nutritional quality (composition of foods), microbial quality, sensory quality.
- 6.4 Evaluate sensory quality of foods, texture of foods, colour of foods and microbial quality.
- 6.5 Study food laws, standards, regulations and specifications, HACCP regulations (Hazard analysis critical control point)
- 6.6 Study and define food adulteration.
- 6.7 Study about the prevention of food adulteration.
- 6.8 Study about misbranding.
- 6.9 Study the executive agencies (ISI,AGMARK (1937),FPO (1955),PFA (1954) , MPO (1974),BIS(1952),CONSUMERS PROTECTION ACT(1986),VANASAPTI CONTROL ORDER(1978),EXPORT QUALITY CONTROL AND INSPECTION ACT(1963).

Sl. No.	Authors	Title	Publishers
1	Jacob	Food Analysis & Quality control	AVI
2	Guthrie	Food Sanitation	AVI
3	Marriot	Principles of Food Sanitation	AVI

PROJECT & SEMINAR

Rationale: Assignment of a project involving a selected chemical engineering operation will give an opportunity to study individually the requirement of setting up a chemical engineering Unit Operation, starting preparation process flow diagram, plant layout, design requirement for processing equipment, process safety, provision for effluent treatment etc.

The object of the project is to make use of the knowledge gained by the student at various stages of the diploma course. This helps to judge the level of proficiency, originality and capacity for application of knowledge attained by the student at the end of the course. Project work is a team work, the students may be divided into different groups. or may be in a single group depending upon the type of project work to be carried out. For the external 50 marks, the project shall be assessed by viva-voce examination to be conducted by the external examiner at the end of the year. Each student must give a seminar talk of 10 to 15 minutes duration. Each group should submit a typed copy of the project report. Each staff member of the Department should guide one group of students. The topics may be given by the department for the project work.