

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA



ESTD-1964

SYLLABUS

B. Voc. (Food Processing & Engineering)

2018 - 2019

**DEPARTMENT OF FOOD PROCESSING
& ENGINEERING**

Scheme of Instruction For B. Voc. (Food Processing & Engineering)

General Education Component

(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)

Semesters	Paper No.	Title	L:T:P	Theory Hours	Tutorial	Practical Hours	Total Hours	Total Credits
					Hours			
Sem I	FPA 020	Communication Language Kannada	3:0:0	45	0	0	45	3
	FPA 510	Biochemistry-I	2:0:1	30	0	15	45	3
	FPA 520	Microbiology-I	2:0:1	30	0	15	45	3
	FPA 540	Computer Fundamentals & DOS	2:0:1	30	0	15	45	3
Sem II	FPB540	Communication Language English	3:0:0	45	0	0	45	3
	FPB 510	Biochemistry-II	2:0:1	30	0	15	45	3
	FPB 520	Microbiology-II	2:0:1	30	0	15	45	3
	FPB 550	Computer C Programming	2:0:1	30	0	15	45	3
Sem III	FPC 550	Indian Constitution	3:0:0	45	0	0	45	3
	FPD 580	Bio statistics	2:0:1	30	0	15	45	3
	FPC 510	Biochemistry-III	2:0:1	30	0	15	45	3
	FPC 520	Microbiology-III	2:0:1	30	0	15	45	3
Sem IV	FPC 570	ICT	2:0:1	30	0	15	45	3
	FPD 510	Biochemistry-IV	2:0:1	30	0	15	45	3
	FPD 520	Microbiology-IV	2:0:1	30	0	15	45	3
	FPD 560	Environmental Studies	3:0:0	45	0	0	45	3
Sem V	FPE 510	Biochemistry-V	4:0:2	60	0	30	90	6
	FPE 520	Microbiology-V	4:0:2	60	0	30	90	6
Sem VI	FPF 510	Biochemistry-V	4:0:2	60	0	30	90	6
	FPF 520	Microbiology-V	4:0:2	60	0	30	90	6
								12

**DEPARTMENT OF BIOCHEMISTRY
SCHEME OF INSTRUCTION**

Scheme of Instruction For B.Voc- Food Processing and Engineering 2018-19									
General Education Component									
NSQF/ NVE QF Level	Vocational Qualification	Semester	Title	L:T:P	Theory Hours	Tutorial Hours	Practical Hours	Total Hours	Credits
Level- IV	Diploma	Semester- I	Biomolecule	2:0:1	30	0	15	45	3
Level- V		Semester-II	Enzymology and Bioenergetics	2:0:1	30	0	15	45	3
Level- VI	Advanced Diploma	Semester-III	Metabolism	2:0:1	30	0	15	45	3
		Semester-IV	Biochemical Techniques	2:0:1	30	0	15	45	3
Level- VII	Degree	Semester-V	Food and Nutrition	4:0:2	60	0	30	90	6
		Semester-VI	Applied Biochemistry	4:0:2	60	0	30	90	6

Proforma of assessment For B.Voc- Food Processing and Engineering 2018-19
General Education Component-Biochemistry

NSQF/ NVE QF Level	Vocational Qualificati on	Semester	Title	Theory				Practical				Credits
				Exam		C-1	C-2	Exam	C-1	C-2		
				Code	Marks	Marks	Marks	Code	Marks	Marks	Marks	
Level- IV	Diploma	Semester- I	Biomolecule	FPA510	70	10	10	FPA530	70	05	05	3
Level- V		Semester-II	Enzymology and Bioenergetics	FPB510	70	10	10	FPB530	70	05	05	3
Level- VI	Advanced Diploma	Semester-III	Metabolism	FPC510	70	10	10	FPC530	70	05	05	3
		Semester-IV	Biochemical Techniques	FPD510	70	10	10	FPD530	70	05	05	3
Level- VII	Degree	Semester-V	Food & Nutrition	FPE510	70	10	10	FPE530	70	05	05	6
		Semester-VI	Applied Biochemistry	FPF510	70	10	10	FPF530	70	05	05	6

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- ✓ A candidate appearing for the first time should submit a duly signed and certified practical record
- ✓ Each candidate has to perform one experiment in the specified duration of three hours for **FORTY FIVE marks**
- ✓ Practical record has to be valued for **TEN marks** by examiners at the time of examination
- ✓ Viva-voce for **FIFTEEN marks** in practical is awarded by continuous assessment in the lab

Sl no	Component	Marks
1	Write up of the experiment	15
2	Conducting experiment	25
3	Result	05
4	Viva-voce	15
5	Practical record	10
TOTAL		70

FPA510

SEMESTER I

Paper –I BIOMOLECULES

(30 hours -2 Credits)

Course Outcome:

After completion of the course a student is able to

CO1: Explain the structure and properties of carbohydrates, lipids, proteins, and nucleic acids in living organisms

CO2: Describe the structure and functions of RNA and DNA

CO3: Understand the role of vitamins in our body

CO4: Understand the behaviour of proteins in solutions

SECTION-I : Amino Acids & Proteins:

09 hrs

1. Introduction to Bio-chemistry.
2. Definition, classification and biological functions of Amino acids and proteins.
3. **Amino Acids:** Common structural features. Stereoisomerism and RS system of designating optical isomers. Classification based on the nature of “R” groups. Amino acids present in proteins and non-protein amino acids. Specialized role of amino acids. Physical and Chemical properties of amino acids. Titration of amino acids.
4. **Proteins:** Levels of protein structure. Forces stabilising structure and shape of proteins. Native proteins and their conformations. Behavior of proteins in solutions. Salting in & salting out of proteins. Denaturation of proteins.

SECTION-II: Carbohydrates:

08 hrs

1. Definition, classification and biological functions of carbohydrates.
2. Monosaccharides-Fischer and Haworth structures of monosaccharides,. Derivatives of monosaccharides (Sugar acids, deoxysugars, amino sugars and other derivatives of biological importance). Oligosaccharides (structure of maltose, lactose, sucrose, cellobiose, and trehalose).
3. Homo-and hetero-polysaccharides (structures of starch, inulin, glycogen, cellulose, chitin). Polysaccharides of bacterial cell wall.

SECTION-III: Lipids

08 hrs

1. Definition and classification of lipids, fatty acids (saturated and unsaturated). Essential fatty acids. m. p., b. p. and their relation to molecular size. Fats as source of energy. Waxes.
2. Structures and functions of lipids : Triacylglycerols, phospholipids : lecithins (PhosphatidylCholines),

cephalins (Phosphotidylethanolamines), Phosphatidylserines, phosphatidyl inositol, sphingomyelins, plasmalogens), cerebrosides, gangliosides.

3. Lipoproteins—Composition, classification and biological functions. Liposomes.
4. Prostaglandins, Leukotrienes, Thromboxanes and their importance.
5. Sources and biochemical functions of water & fat soluble vitamins.

SECTION-IV : Nucleic Acid

05 hrs

1. Nucleic Acids: Structure and properties of purine and pyrimidine bases. Nucleosides and nucleotides. Biologically important nucleotides. Double helical model of DNA. Denaturation of DNA. Physical and chemical properties of nucleic acids.

FPA530

PRACTICALS

(15 Hrs 1 Credits)

1. Qualitative tests for : (a) Carbohydrates. (b) Amino acids and proteins (c) Cholesterol and lipids
3 Hrs X 2
2. Estimation of amino acid by formal titration **3 Hrs**
3. Estimation of ascorbic acid by dye method. **3 Hrs**
4. Estimation of reducing sugars by DNS method **3 Hrs**

FPB510

Semester II

Paper II

(30 hours – 2 credits)

ENZYMOLGY AND BIOENERGETICS

Course Outcome:

After completion of the course a student is able to;

CO1: Describe the role and functions of enzymes.

CO2: Understand the role of cofactor and coenzymes in enzyme catalysed reactions.

CO3: Describe the applications of enzymes in diagnostics.

CO4: Discuss the commercial importance of enzymes.

SECTION-I : Enzymology

08 hrs

Introduction to enzymes - General characteristics of enzymes. Prosthetic group. Holoenzymes, apoenzyme and cofactors. Coenzymes and their biochemical functions, assay of enzyme activity, units of enzyme activity. Active sites(s) of enzymes. IUB system of nomenclature and classification of enzymes. Enzymes as catalysts. Theories of enzymes catalysis: Acidbase catalysis, covalent catalysis.

SECTION-II: Enzyme Purification :

08 hrs

Need for purification. Preliminary fractionation procedures and precipitation techniques, Chromatography methods : Gel filtration, adsorption–, ion exchange– and affinity chromatography. Types of support materials. Selection of appropriate conditions and elution procedures. Criteria of enzyme purity.

SECTION-III : Enzyme Kinetics

09 hrs

Factors affecting velocity of enzyme catalysed reactions: Enzyme concentration, pH and temperature. Michaelis –Menten equation. Determination of K_m and its significance. Enzyme inhibition. Various types of enzyme inhibitions. Enzyme inhibitors and their importance. Allosteric enzymes and enzyme regulation. Isoenzymes and their clinical significance.

SECTION-IV: Bioenergetics

05 hrs

Biological systems and concept of free energy, Endergonic processes and role of ATP & other high energy compounds. Biological oxidations. Redox potential. Commercial importance of enzymes

FPB530

PRACTICALS (15 Hrs – 1 Credit)

1. Assay of salivary amylase enzyme activity. **3 Hrs**
2. Effect of pH on enzyme activity. **3 Hrs**
3. Effect of temperature on enzyme activity **3 Hrs**
4. Effect of substrate concentration on enzyme activity and determination of K_m and V_{max} **3 Hrs**
5. Effect of activators (NaCl) on salivary enzyme activity **3 Hrs**

METABOLISM**Course Outcome:**

After completion of the course a student is able to;

CO1: Gain the knowledge on cellular metabolism and their regulations

CO2: Able to describe the linked pathways of metabolism

CO3: Demonstrate an understanding of the metabolic pathways - the energy-yielding and energy-requiring reactions in life.

CO4: Understand the role of enzymes in metabolic reactions.

SECTION-I**Carbohydrate Metabolism****08****hrs**

Digestion, Absorption and transport of Carbohydrates, Metabolic Pathways, Glycolysis, Pentose Phosphate Pathway, Glucuronate and glyoxylate pathway, TCA cycle, Glycogenolysis& Glycogenesis, Gluconeogenesis. Diseases associated with carbohydrate metabolism.

SECTION-II**Lipid Metabolism****08****hrs**

Digestion, absorption & Transport of Lipids, β -Oxidation of fatty acids. α and ω oxidation of fatty acids Degradation of triglycerides and phospholipids. Formation and utilization of ketone bodies. Biosynthesis of saturated fatty acids, Biosynthesis of Cholesterol. Diseases associated with Lipid metabolism.

SECTION-III**08 hrs****Protein Metabolism**

Digestion, absorption & transport of Proteins, General Reactions of Amino Acids : Deamination, transamination and decarboxylation. Urea cycle and its significance. Ketogenic and glucogenic amino acids. Biosynthesis of amino acids (Phenyl alanine and Glutamic acid) and their degradation. Diseases associated with Proteins metabolism.

SECTION-IV**06 hrs****Nucleic acid Metabolism**

Degradation of purines and pyrimidines. Biosynthesis of purines, pyrimidines and nucleotides. Catabolism of Heme & Formation of Bile pigments. Diseases associated with Nucleic acid metabolism.

- | | | |
|----|---|--------------|
| 1. | Estimation of protein by Biuret method. | 3 Hrs |
| 2. | Estimation of Ca ⁺ in serum. | 3 Hrs |
| 3. | Estimation of iron in drumstics | 3 Hrs |
| 4. | Estimation of creatinine in serum. | 3 Hrs |

5. Estimation of uric acid in urine

3 Hrs

BIOCHEMICAL TECHNIQUES**Course Outcome:**

After completion of the course a student is able to;

CO1: Use selected analytical techniques for the separation of biomolecules.

CO2: Differentiate certain functionalities of biomolecules by using spectroscopic techniques.

CO3: Understand the intersection of life and information sciences, using different sequencing and mapping like SDS-PAGE, TLC, GLC and Chromatography.

CO4: Explain the dangers and safety precautions associated with x-rays and identify the various isotopes used in radiography.

SECTION-I**08 hrs****Spectroscopic Techniques :**

Beer-Lambert's Law. Light absorption and its transmittance. Determination and application of extinction coefficient. Principle and Applications of following spectroscopic techniques - U.V.-Visible, infra-red, Fluorescent emission and NMR spectroscopy.

SECTION-II**08 hrs****Electrophoretic Techniques :**

Principles and applications of the following electrophoresis techniques. Paper electrophoresis, PAGE, SDS- PAGE.

Centrifugation Techniques :

Principle of differential and density gradient centrifugation. Ultra centrifuge – construction and applications

SECTION-III**08 hrs****Chromatographic Techniques:**

Principles of Adsorption and Partition chromatography. Techniques of ascending, descending, circular paper chromatography.

Thin Layer Chromatography-Technique and advantages over paper chromatography

Column chromatography – Principle and applications of Gel Filtration chromatography, ion – exchange chromatography.

SECTION-IV**06 hrs**

Radio Isotopic Techniques :

Properties of radioactive emissions. Units of radioactivity. Isotopes and their applications in biological studies - ^3H , ^{14}C , ^{131}I , ^{60}CO , and ^{32}P . Techniques used to measure radioactivity- GM counter. Biological hazards of radiation and safety measures in handling radioisotopes.

FPD530**PRACTICAL****(15 Hrs = 1 Credits)**

- | | |
|--|--------------|
| 1. Identification of amino acids by circular paper chromatography. | 3 Hrs |
| 2. Identification of amino acids by ascending Paper chromatography | 3 Hrs |
| 3. Separation of phospholipids by thin layer chromatography. | 3 Hrs |
| 4. Separation of leaf pigments by column chromatography. | 3 Hrs |
| 5. Separation of proteins by PAGE. | 3 Hrs |

FPE510

Semester V

PaperV

(60 hours-4 Credits)

FOOD AND NUTRITION

Course Outcome:

After completion of the course a student is able to;

CO1: Explain the theoretical and practical uses on micro and macronutrients.

CO2: Describe the role of electrolytes in nutritional biochemistry and their functions in metabolism.

CO3: Explain the role of nutrients in the optimal functioning of key biochemical pathways in the body.

CO4: Discuss the biological roles and deficiency disorders of proteins.

SECTION-I

15 Hrs

1. Introduction:

Concept of Nutrition, Calorific value of foods and its determination (Bomb calorimeter), different components of energy expenditure, measurement of energy expenditure by direct and indirect calorimetric method (principles only) Energy expenditure at rest and work, respiratory quotient, Basal Metabolic Rate (BMR), determination of BMR by indirect calorimetric method, factors affecting BMR. Specific dynamic action of foods.

Proximate analysis of food samples:

Moisture, fiber, ash, proteins, carbohydrates, fats and their importance

Carbohydrates:

Dietary sources, dietary fibres and protein sparing action, glycemic index and its importance

Fats

Dietary sources, Visible and invisible fats, trans fats and its effects in fried foods

Water Metabolism

Distribution in the body, factors maintaining water balance and factors influencing water balance.

SECTION-II

15 Hrs

1. Proteins:

Dietary sources, nutritional classification, Nutritional value of proteins – PER, Digestive coefficient, NPU and Biological value of proteins (BV). Essential amino acids. Nitrogen balance, mutual supplementation of proteins, Malnutrition – Kwashiorkor and marasmus (causes, clinical signs with symptoms & treatment

Vitamins

Classification, example with structure, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms– Thiamine, Riboflavin, Niacin, pantothenic acid, Pyridoxine, Biotin, Folic acid,.

SECTION – III

15 Hrs

Structures, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms- Vitamin B12,C,A,D,E & K. Hypervitaminosis.

Minerals:

Dietary sources, physiological functions, deficiency disorders, absorption, balance and excretion of Macro nutrients- Ca, P, Na, K, Cl and Micronutrients – Fe, Zn, Cu, I & Mg

SECTION IV

15Hrs

Digestion:

Gastrointestinal tract secretions - Composition and functions of Saliva, gastric, bile, pancreatic and intestinal Juices. Appetite, gastrointestinal tract hormones.

Digestion, absorption and transport of carbohydrates, proteins and fats

Antinutritional factors: Sources and harmful effects of anti vitamins (e.g.: avidin, dicumarol), Protease inhibitors, oxalates and fitates. Natural toxicants, (e.g.: Lathyrus sativa). Food adulterants- structure and harmful effects of - Butter yellow, lead chromate and malachite green.

FPE530

PRACTICAL

(30 Hrs = 2 Credits)

- | | |
|--|----------------|
| 1. Estimation of haemoglobin in blood. | 3 Hrs |
| 2. Identification of Sugars in fruit juice using paper chromatography. | 3 Hrs |
| 3. Determination of nature of inhibition of alkaline phosphatase by cysteine. | 3 Hrs |
| 4. Determination of proteins by dye binding assay. | 3 Hrs |
| 5. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate (by difference) (3 experiments) | 3 HrsX3 |
| 6. Detection of adulterants in food. | 3 Hrs |
| 7. Estimation of Calcium in ragi. | 3 Hrs |
| 8. Estimation of Vitamin – C in lemon or gooseberries by DPPH method. | 3 Hrs |

PPF510

Semester VI

Paper– VI

(60 hours -4 Credits)

APPLIED BIOCHEMISTRY

Course Outcome:

After completion of the course a student is able to;

CO1: Explain concepts such as gene structure, function, and its regulation.

CO2: Discuss the molecular events and enzymes involved in DNA replication.

CO3: Understand the functions of immune system including organs, cells and receptors.

CO4: Discuss the elementary aspects of the molecular biology of cancer

SECTION-I

10 Hrs

DNA Organization: Structure of chromatin – Histones and Nucleosomes. Active and inactive chromatin. Compaction of Chromatin. Chromosomes, Structure of Genome in eukaryotes. Rearrangements in Genetic Material. Integration of Chromosomes with viruses. Transposition, Experimental proofs for DNA as genetic material.

SECTION-II

20 Hrs

DNA Replication : Semiconservative replication-proof. Molecular events and enzymes involved in DNA replication. DNA repair mechanisms. Mutations. RNA Synthesis : Initiation, elongation and termination during RNA synthesis. Transcription signals. Processing of RNA. Introns and Exons. Nucleases. Genetic Code and Protein Biosynthesis : Characteristics of Genetic code, Deciphering of Genetic Code. Initiation, elongation and termination of protein chains. Post translational modifications in proteins. Inhibitors of protein biosynthesis.

SECTION-III

15 Hrs

Definition of immune system and antigens. Cells involved in immune response. T-cell and B-cells, Immunoglobulins, chemical structure of the Antibody molecule. Haptens and carrier molecules, cell mediated immune response. Complement system, activation and its role in defense. Brief discussion of various immunological techniques; Precipitation reactions in gels Haemagglutination, Immuno-fluorescence, radio-immunoassay (RIA), enzyme linkedimmunoabsorbent assay (ELISA) and immunoblotting.

SECTION-IV

15 Hrs

Membranes : Structure and functions of biological membranes, various models of membrane structure. Transport of solutes across membranes, Sodium pump. Elementary aspects of the Molecular Biology of cancer and introduction to stem cells. Molecular basis of the Origin and Evolution of Life.

FPF530

PRACTICALS

(30 Hrs = 2 Credits)

- | | |
|---|----------------|
| 1. Estimation of DNA by diphenylamine method. | 3 Hrs |
| 2. Effect of temperature on the Viscosity of DNA using Oswald's viscometer. | 3 Hrs |
| 3. Assays of SGPT and SGOT in serum. | 3 Hrs X |
| 4. Extraction of RNA from yeast and its estimation by Orcinol method. | 3 HrsX2 |
| 5. Determination of total protein and A/G ratio in serum. | 3 Hrs |
| 6. Estimation of serum phospholipids. | 3 Hrs |
| 7. Immobilization of enzymes/ cells by entrapment in alginate gel. | 3 Hrs |
| 8. Demonstration of ELISA. | 3 Hrs |

**Pattern of Question Paper for Boc Voc
Semester I to VI
Paper I to VI**

Time : 2 Hrs 30 Mins

Max Marks 70

1. Answer all the questions in one sentence or a word

10 X 1

= 10

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----
- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

5. Answer any four of the following questions

4 X 5 =

20

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

6. Answer any four questions of the following

4 X 10 = 40

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

(Note- 10 Marks may be divided in to 6+4 or 5+5)

I SEMESTER PRACTICAL EXAMINATION

BIOMOLECULES

PRACTICAL I

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART

15 Marks

The candidate has to write principle and procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Estimation of amino acid by formal titration
2. Estimation of ascorbic acid by dye method.
3. Estimation of reducing sugars by DNS method

PART B

Qualitative Analysis of Biomolecules

30 Marks

Any one of the following substances may be given for identification

1 Carbohydrate – Glucose, Fructose, Galactose, Lactose, Maltose, Sucrose and Starch.

2 Amino acids – Arginine, Tryptophan, Tyrosine, Cystein, Histidine, phenyl alanine

3 Proteins- Albumin and casein.

PART C

15 Marks

Viva

SCHEME OF VALUATION

(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.

4 experiments = 06 marks

Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Qualitative Analysis Of Biomolecules

1 Identification of the class of biomolecule 4 Marks

If carbohydrate is given

i) Reducing test(any two test) 7 Marks

ii) Classification test 6 Marks

iii) Distinguishing test (aldose or ketose) 6 Marks

iv) Preparation of osazone and identification 7 Marks

If aminoacid or protein is given, following tests may be conducted

i) Precipitation test

ii) Xanthoproteic test

iii) Millons test

iv) Sakaguchi test

v) Lead acetate/Sodium nitroprusside test 5 x 6 = 30 Marks

PART C

Viva- Five questions

5 x 3 = 15 Marks

II SEMESTER PRACTICAL EXAMINATION
ENZYMOLOGY AND BIOENERGETICS
PRACTICAL II
SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A

15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Assay of salivary amylase enzyme activity.
2. Effect of pH on enzyme activity.
3. Effect of temperature on enzyme activity
4. Effect of substrate concentration on enzyme activity and determination of K_m and V_{max}
5. Effect of activators (NaCl) on salivary enzyme activity

PART B

30 Marks

Any one of the following experiment may be set

- 1 Determination of specific activity of Salivary amylase by DNS.
- 2 Determination of pH optimum of Salivary amylase.
- 3 Determination of K_m and V_{max} of Salivary amylase.
- 4 Determination of initial velocity (time Kinetics) of Salivary amylase.

Note-

1. Specific activity:

- i) Standard solution of reducing sugar must be supplied by the examiner.

- ii) Concentration of protein in enzyme solution must be given to the students.
- 2. Optimum pH: buffer of 5 different values from 5 to 9 may be given (buffer solutions is to be supplied named as A,B,C,D,E and asked to found out the buffer in which activity is maximum)
- 3. Optimum time: 10' , 20' , 30' , 40' and 50'range may be considered for the time kinetics.
- 4. Determination of K_m and V_{max} : substrates of different concentration range such as 2, 5, 10, 15, 20 and 30 uMole maybe given(Standard graph of the substrate must be given).

PART C

15 Marks

Viva

SCHEME OF VALUATION
(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

- i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
- ii) For accuracy and neatness = 03 marks.

PART B

Distribution of marks for enzyme assay

- | | |
|---------------------------------|----------|
| 1. Tabular column | 5 Marks |
| 2. For conduction of experiment | 12 Marks |
| 3. Graph | 5 Marks |
| 4. Calculation | 4 Marks |
| 5. Result | 4 Marks |

PART C

Viva- Five questions

5 x 3 = 15 Marks

III SEMESTER PRACTICAL EXAMINATION

METABOLISM

PRACTICAL III

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A

15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Estimation of protein by Biuret method.
2. Estimation of Ca⁺ in serum.
3. Estimation of iron in drumstics
4. Estimation of creatinine in serum
5. Estimation of uric acid in urine

PART B

30

Marks

Any one of the following experiment may be set

1. Estimation of protein by Biuret method.
2. Estimation of Ca⁺ in serum.
3. Estimation of iron in drumstics
4. Estimation of creatinine in serum
5. Estimation of uric acid in urine

PART C

15

Marks

Viva

SCHEME OF VALUATION

(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

- i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
- ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

- | | |
|---------------------------------|----------|
| 1. Tabular column | 5 Marks |
| 2. For conduction of experiment | 5 Marks |
| 3. Graph | 5 Marks |
| 4. Result | |
| Up to 10% error | 10 Marks |
| Up to 15% error | 8 Marks |
| Up to 20% error | 6 Marks |
| Any other value | 4 Marks |

Assessment of experimental results for Calcium estimation

Preparation of standard solution and calculation of the normality - 6 Marks

Discrepancy	Standardization	Estimation
0.1 ml	10 Marks	10 Marks
0.2 ml	8 Marks	8 Marks
0.3 ml	6 Marks	6 Marks
Any other value	4 Marks	4 Marks
Calculation	2 Marks	2 Marks

PART C

Five questions

5x 3 = 15 Marks

**IV SEMESTER PRACTICAL EXAMINATION
BIOCHEMICAL TECHNIQUES**

PRACTICAL IV

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A

15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Identification of amino acids by circular paper chromatography.
2. Identification of amino acids by ascending Paper chromatography
3. Separation of phospholipids by thin layer chromatography.
4. Separation of leaf pigments by column chromatography
5. Separation of proteins by PAGE

PART B

30

Marks

Any one of the following experiment may be set

1. Identification of amino acids by circular paper chromatography.
2. Identification of amino acids by ascending Paper chromatography
3. Separation of phospholipids by thin layer chromatography.
4. Separation of leaf pigments by column chromatography

PART C

15

Marks

Viva

SCHEME OF VALUATION
(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

- i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
- ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

- 1. Principle and Procedure writing.....12 marks
- 2. For development of Chromatogram..... 12 marks
- 3. For correct identification.....6marks

PART C

Viva- Five questions

5x 3 = 15 Marks

V SEMESTER PRACTICAL EXAMINATION

FOOD AND NUTRITION

PRACTICAL V

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A

15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Identification of Sugars in fruit juice using paper chromatography.
2. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate (by difference) (3 experiments)
3. Detection of adulterants in food.

PART B

30

Marks

Any one of the following experiment may be set

1. Estimation of haemoglobin in blood.
2. Determination of nature of inhibition of alkaline phosphatase by cysteine.
3. Determination of proteins by dye binding assay.
4. Estimation of Calcium in ragi.
5. Estimation of Vitamin – C in lemon or gooseberries by DPPH method

PART C

15 Marks

Viva

SCHEME OF VALUATION

(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

- i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
- ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

- 1. Tabular column 5 Marks
- 2. For conduction of experiment 5 Marks
- 3. Graph 5 Marks
- 4. Result
 - Up to 10% error 10 Marks
 - Up to 15% error 8 Marks
 - Up to 20% error 6 Marks
 - Any other value 4 Marks

Assessment of experimental results for Calcium and vitamin C estimation

Preparation of standard solution and calculation of the normality - 6 Marks

Discrepancy	Standardization	Estimation
0.1 ml	10 Marks	10 Marks
0.2 ml	8 Marks	8 Marks
0.3 ml	6 Marks	6 Marks
Any other value	4 Marks	4 Marks
Calculation	2 Marks	2 Marks

PART C

Viva- Five questions

5 x 3 = 15 Marks

VI SEMESTER PRACTICAL EXAMINATION

**APPLIED BIOCHEMISTRY
PRACTICAL VI**

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A

15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Effect of temperature on the Viscosity of DNA using Oswald's viscometer.
2. Extraction of RNA from yeast.
3. Immobilization of enzymes/ cells by entrapment in alginate gel
4. Demonstration of ELISA

PART B

30

Marks

Any one of the following experiment may be set

1. Estimation of DNA by diphenylamine method.
2. Assays of SGPT and SGOT in serum.
3. Estimation RNA by Orcinol method.
4. Determination of total protein and A/G ratio in serum.
5. Estimation of serum phospholipids.
- 6.

PART C

15

Marks

Viva

SCHEME OF VALUATION

(ASSESSMENT OF EXPERIMENTAL RESULTS)

CLASS RECORDS :

- i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
- ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

- | | |
|---------------------------------|----------|
| 1. Tabular column | 5 Marks |
| 2. For conduction of experiment | 5 Marks |
| 3. Graph | 5 Marks |
| 4. Result | |
| Up to 10% error | 10 Marks |
| Up to 15% error | 8 Marks |
| Up to 20% error | 6 Marks |
| Any other value | 4 Marks |

PART C

Viva- Five questions

5 x 3 = 15 Marks

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DEPARTMENT OF MICROBIOLOGY

Revised Scheme of Instruction For B.Voc- Food Processing and Engineering 2016-17									
General Education Component									
NSQF/ NVE QF Level	Vocational Qualification	Semester	Title	L:T:P	Theory Hours	Tutorial Hours	Practical Hours	Total Hours	Credits
Level- IV	Diploma	Semester- I	Fundamental s of Microbiology	2:0:1	30	0	15	45	3
Level- V		Semester- II	Microbial Physiology And Metabolism	2:0:1	30	0	15	45	3
Level- VI	Advanced Diploma	Semester- III	Food Microbiology	2:0:1	30	0	15	45	3
		Semester- IV	Immunology	2:0:1	30	0	15	45	3
Level- VII	Degree	Semester- V	Pathogenic Microbiology	4:0:2	60	0	30	90	6
		Semester- VI	Medical Microbiology	4:0:2	60	0	30	90	6

Paper code: FPA520
Credits

MICROBIOLOGY

30hours-2

I B.Voc., I Semester

TITLE: FUNDAMENTALS OF MICROBIOLOGY

Course outcome:

After successful completion of this course students are able to:

- CO1:** Gain basic knowledge about Microbiology starting from history to Microorganisms.
- CO2:** Various Culture media and their applications and also understand various physical and chemical means of sterilization.
- CO3:** Know about microbial techniques for isolation of pure cultures of bacteria.
- CO4:** To identify the bacteria based on staining and cultural characteristics.
- CO5:** Able to perform routine culture handling tasks safely and effectively.
- CO6:** The maintenance and preservation of cultures.

UNIT-I

10Hrs

1. History: Contributions of - Antony van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Dmitry Iwanowski, Alexander Fleming (in brief).
Development and scope of Microbiology. Branches of Microbiology.
2. Microscopy: Types of Microscope, Construction and working principle of bright field microscope. Dark field, fluorescence and phase contrast microscopy(application). Electron microscopy- Types, applications and their limitations.
3. Staining technique: Types of stains, Principle of Simple, negative and differential staining techniques (gram's staining).

UNIT-II

06hrs

Sterilization technique: Definition – Sterilization, disinfection, antiseptic, antibiosis, Fungicide, Bactericide.

A. Physical methods:

- a) Heat –
 - i) Dry heat – Hot air
 - ii) Moist heat method – Autoclave and Pressure cooker
- b) Filtration–Types of filters: Membrane filter, Hepa filter (e.g., Laminar air flow)
- c) Radiation methods – UV rays, Gamma rays and Cathode rays

B. Chemical method: Use and mode of action of- Alcohols, Aldehydes, Halogens and Phenols.

UNIT-III

06hrs

Media – Types, Pure culture and Cultural characteristics: Serial dilution, pure culture by isolation – Pour plate, Spread plate, Streak plate and Micromanipulator techniques . Colony characteristics – plate cultures/solid media and broth cultures/liquid media. Maintenance and Preservation of pure cultures – Sub culturing, overlaying with mineral oil, Refrigeration

(4°C) Lyophilization and cryopreservation.

UNIT-IV

08hrs

1. Comparative account of Prokaryotic and eukaryotic cell. Systems of classification: Haeckel's three-kingdom, Whittaker's five-kingdom and Cavalier-Smith's eight kingdom classification.
2. General characteristics of bacteria, fungi, actinomycete, virus, protozoa and algae. Organization of cell wall, cell membrane, flagella capsules and formation of spores in bacteria.
3. Bacteriophages : Morphology and multiplication(T-4 phage)

PRACTICALS

15 Hrs -1 Credit

1. Staining and mounting of algae and fungi **3Hrs x1**
2. Simple, Negative and Gram's staining **3Hrs x1**
3. Preparation of culture media- Nutrient agar, PDA and NB **3Hrs x1**
4. Methods of obtaining pure cultures of microorganism-Spread plate, pour plate and streak plate and subculturing **3Hrs x1**
5. Isolation of microorganisms from soil by serial dilution technique (Bacteria and Fungi) **3Hrs x1**

Paper code: FPB520

MICROBIOLOGY

30hours-2 Credits

I B.Voc.,II Semester

TITLE: MICROBIAL GROWTH AND METABOLISM

Enable the students to have sound knowledge about:

CO1. Inculcate the knowledge regarding microbial growth, functions, physiology and metabolism.

CO2. Understand the microbial transport systems and microbial metabolism

CO3. Know the microbial growth in response to environmental factors.

CO4. Get equipped with various methods of bacterial growth measurement.

CO5. Knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation.

UNIT: I

08Hrs

1. Major nutritional type of Microorganisms.
2. Nutritional requirements of Microorganisms. Elementary nutrients: Carbon, Nitrogen, Sulphur, Oxygen and Energy sources, Vitamins and Growth factors.
3. Uptake of nutrients: Diffusion- Simple and Facilitated, Active transport (use of Proton motive force, ATP : ABC transporter), Group translocation, Iron uptake.

UNIT: II

07Hrs

1. Definition, Growth rate and generation time. The growth curve in batch culture - Phases of growth and their significance.
2. Physical and chemical factors affecting growth-Temperature, pH, Oxygen and saline (water activity) Requirements. Measurement of growth by cell number (Haemocytometer) and cell mass (Turbidometer).

UNIT:III

05Hrs

Microbial Enzymes: Definition, Nomenclature, Classification, Properties, Mode and Mechanism of enzyme action, Factors effecting enzyme action. Cofactors and Coenzymes.

UNIT:IV

10Hrs

Aerobic respiration: Definition, Sugar degradation pathways - EMP, HMP and ED pathways. Ultra structure of Mitochondrion, Formation of acetyl CoA from pyruvate, TCA cycle, Electron transport system and Oxidative phosphorylation

Anaerobic respiration: Introduction, Anerobic respiration with special reference to dissimilatory Nitrate reduction. (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways).

PRACTICALS

15 hours– 01 Credit

1. Effect of temperature and pH on growth of bacteria. **3Hrs x1**
2. Acid and gas production from carbohydrates- Demonstration of fermentation of lactose **3Hrs x1**
3. Turbidimetric/spectrophotometric monitoring of growth using liquid cultures **3Hrs x1**
4. Cell counting by Haemocytometer **3Hrs x1**
5. Starch hydrolysis **3Hrs x1**

Enable the students to get sufficient knowledge about:

CO1.Food related microorganisms, their contamination, spoilage and preservation

CO2. The significance and activities of microorganisms in food

CO3. Understand the food borne intoxication and infections.

CO4. Learn about food safety and quality control.

CO5. The principles involving various methods of food preservation.

UNIT:I

10Hrs

1. Introduction to Food Microbiology: Definition, Concept and Scope. Food as a substrate for microorganisms. .
2. Contamination, preservation and spoilage in various foods viz. – fruits and vegetables, canned foods, cereals and cereal product(cereal grains, flour, bread, pasta, macroni), sugars & sugars products (Honey, Candy), Meat (Fresh meat, fish), Milk and Milk products (cheese, butter).

UNIT:II

05Hrs

1. Methods of food preservation: Physical method – high temperature, low temperature, canning. Drying – solar drying, drum drying, spray drying. Radiation.
Chemical methods – chemical preservatives – salient features of the chemical preservatives (propionates, benzoate, sorbates, nitrates and nitrites, sulphur dioxide and sulphates, sugar and salt)

UNIT:III

05Hrs

1. Food borne intoxication and infection:
Bacterial intoxication- Botulism,
Bacterial infection- Salmonellosis.
Mycotoxin – Origin, types and importance of toxins with reference to Aflatoxins.
- 2.. Food safety and quality control. –A brief account on FPO, HACCP, Food laws and Food standards (in brief)

UNIT:IV

10Hrs

1. Microorganisms of industrial importance. Biology of industrial microorganisms: Isolation, Screening, Improvement and Preservation.
2. Raw materials-Molasses, corn steep liquor, sulphite waste liquor and whey. Buffers, Precursors, Inhibitors and Antifoam agents.
3. Fermenters and fermentation process: Design, types and basic function of fermenters, Fermentation process – Surface, Submerged and Solid state fermentation. Types- Batch and Continuous fermentation.
4. Yeasts (Baker's) and its uses, Production of : Wine , Alcohol and lactic acid.

PRACTICALS

3hrsX5 practicals

- 1. Isolation and identification of fungi from spoiled fruits and vegetables 3hrsx1**
- 2. Isolation and enumeration of bacteria from spoiled fruits and vegetables 3hrsx1**
- 3. Production of citric acid using *Aspergillus niger*. 3hrsx1**
- 4. Estimation of lactic acid in milk 3hrsx1**
- 5. Preparation of alcohol using jaggery or molasses. 3hrsx1**

Paper code: FPD520

MICROBIOLOGY
II B.Voc.,IV Semester
TITLE: IMMUNOLOGY

30hours-2 Credits

The course provides a solid foundation to understand:

- CO1.** Demonstrate and understanding the key concepts in immunology.
- CO2.** Understand the overall organization of the immune system.
- CO3.** To make them understand the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.
- CO4.** Learn about immunization, preparation and its importance.

UNIT-I

10 hrs

Introduction and history of Immunology,

Innate immunity- Physical Barriers, Biochemical, Cellular, Genetic factors, Body temperature, inflammation and fever

Acquired Immunity- Active & Passive Immunity,

Immune organs and cells: Primary lymphoid organs (Thymus, Bone marrow) & Secondary Lymphoid organs (Lymph nodes, Spleen and tonsils). Mucosa Associated Lymphoid tissue (MALT).

Immune cells- Role of immune cells. Stem cells. Lymphocytes- B lymphocytes-lymphocytes and Null cells. Types of T-cells. Macrophages: Types and function of macrophages.

Immune Response: Humoral Immune Response, Cell Mediated Immune response and Mechanism of AMI and CMI

UNIT-II

05 hrs

Antigens: Nature and types.

Antibodies: Basic structure of immunoglobulin-IgG, Biological properties of immunoglobulins, Monoclonal antibodies. Function and type of antibodies.

UNIT-III

08 hrs

Antigen- Antibody reactions: Salient features of Antigen-Antibody reaction. Precipitation reaction: Immunodiffusion test, Wasserman's test, RPR Test. Agglutination reaction: Blood grouping, Widal test. Complement fixation tests, Opsonization, Immunotechniques: ELISA

UNIT-IV

07 hrs

Immunoprophylaxis: Types of vaccines- Live and Attenuated (Bacterial and Viral) and Toxoid with an example each. National Immunization program (Tabular form).

PRACTICALS

3hrsX5=15 practicals

1. Demonstration of Immune organs (through photographs).
2. Demonstration of Immune cells in the smears prepared from Immune organs. (through photographs)
3. Agglutination- Blood Grouping test
4. Precipitation: Immunodiffusion test –ODD

5. Precipitation: Immunodiffusion test –RID

Paper code: FPE520

MICROBIOLOGY

60 hours -4 Credits

III B.Voc., V Semester

TITLE: PATHOGENIC MICROBIOLOGY

The course provides a solid foundation to understand:

CO1.The human immune response towards microbes in medical microbiology

CO2. Knowledge is gained about the relationship between microorganism and human disease, pathogenicity, Laboratory diagnosis, treatment and prophylaxis.

UNIT-I

20 Hrs

Introduction to important diseases caused by Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Bacillus, Clostridium, Enterobacteriaceae (Proteus, Shigella, Salmonella), Vibrio, Yersinia, Hemophilus, Mycobacterium, The operative pathogenic mechanisms, laboratory diagnosis, prevention and control of these diseases.

UNIT-II

15 Hrs

Morphology, pathogenesis, life cycle, laboratory diagnosis, prevention and control of viral diseases viz. Rabies, Polio, Small pox, Herpes, Measles, Influenza and AIDS.

UNIT-III

15 Hrs

Introduction to Human mycotic infections viz Cryptococcosis, Dermatophytosis, Blastomycosis, Opportunistic Mycosis; Candidiasis and Aspergillosis.

UNIT-IV

10 Hrs

Life cycle, pathogenic, mechanisms and control of parasitic infections viz. amoebiasis, Kala-azar, toxoplasmosis, ascariasis, filarasis, hook worm infections.

PRACTICALS

3 hrsX10 practicals

1- 4. Identification of both gram positive and gram negative microorganisms on the basis of :

(i) Morphology.

(ii) Bio-chemical characteristics.

(iii) Serological reactions.

5. Stainings – Alberts, ZNCF.

6-7. Demonstration of pathogens (Viruses, fungi, parasites) through photographs/ permanent mounted slides.

8-9. Demonstration of cysts/ovas of protozoa/Helminths through photographs.

10. Isolation of dermatophytes from human skin.

Paper code: FPF520

MICROBIOLOGY
III B.Voc., VI Semester
TITLE: MEDICAL MICROBIOLOGY

60 hours -4 Credits

Course outcome

On successful completion of this course the student will gain knowledge about:

- CO1.** Health clinics such as examination, collection of clinical samples and diagnosis.
- CO2.** Beneficial and harmful effect of normal flora
- CO3.** Host pathogen interaction
- CO4.** Determining level of antimicrobial activity and Mechanism of action of antimicrobial agents

UNIT-I

15 Hrs

Brief introduction to terminology of Infectious diseases, Frequency of disease- morbidity and mortality rate. Characteristics of infectious disease.
Infections – Classification, sources, mode of transmission and types of infections.
Disease cycle –Sources, reservoirs, carriers and transmission of pathogen. Emerging (HIV/AIDS, Avian influenza) and reemerging (Tuberculosis, Malaria) Infectious diseases, Global travel & Health considerations.

UNIT-II

15 Hrs

Normal flora of human body –Resident flora and transient flora. Beneficial and harmful effect of Normal Flora. Distribution and occurrence of Normal Flora of Skin, Eye, Respiratory Tract, Mouth, Intestinal Tract & Genitourinary Tract. Germfree and Gnotobiotic Life.

UNIT-III

10 Hrs

Host pathogen interaction –Factors predisposing to microbial pathogenicity- Virulence, Exaltation and attenuation. Determinants of virulence-transmissibility, adhesion, invasiveness, toxigenicity-exotoxins and endotoxins. Avoidance of host defence mechanism.

UNIT-IV

20 Hrs

Development of chemotherapy, General characteristics of antimicrobial drugs, Determining level of antimicrobial activity, Mechanism of action of antimicrobial agents, factors influencing the effectiveness of antimicrobial drugs, Antibacterial drugs viz Sulfonamides, Streptomycin, Quinolones, Penicillins, Cephalosporins, Tetracyclines, Erythromycin, Chloramphenicol, Drug Resistance, Antifungal and Antiviral drugs.

PRACTICALS : 10X3Hrs

30 Hrs -2 Credits

1. Sterilization – Introduction to autoclave, hot air oven, filter sterilization.
2. Microbial flora off mouth-teeth crevices
3. Estimation of urine bacteria by calibrated loop method-Direct streak method.
4. Normal flora of human skin
5. Antibiotic sensitivity test
6. Streptomycin resistant mutant strain isolation by gradient plate technique

7. Identification of enteric pathogens using triple sugar iron agar medium
8. Determination of susceptibility to dental caries by Snyder test
9. Evaluation of antiseptics by filter paper disk method
10. Study of antimicrobial drugs as per theory syllabus.

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PATTERN OF QUESTION PAPER FOR B.VOC
SUBJECT: MICROBIOLOGY
(THEORY:I SEMESTER TO VI SEMESTER)

Time: 3hours

Max marks: 70

I. Define/Explain any ten in one/two sentences: 3X10=30
(Twelve questions to be given and ten to be answered)

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

II Answer any FOUR of the following: 4X4=16
(Six questions to be given and four to be answered)-short answer type

- 13
- 14
- 15
- 16
- 17
- 18

III (Three essay type questions- with all internal choices) 8X3=24

- 19
- 20
- 21

Test+ Assessment (C-1+C-2) = 30 (15+15)

SCHEME OF PRACTICAL EXAMINATION
I B.Voc., I SEMESTER: PRACTICAL- I

Time: 3hours

Max marks: 70

- I. Write critical notes on **A, B** and **C**
(Stains, Media, Pure culture plates) as per syllabus
- II. Stain the given material D by.....method. Write the principle, procedure and leave the preparation for evaluation.
(Simple staining/Gram-staining/Wet mounting of Algae and fungi/Negative staining)
(Preparation-10marks; Principle and Procedure-10 marks) 20
- III Demonstrate/ Perform the experiment E giving the principle and procedure.
Record the result. 25
(Demonstration- 10 marks; principle-5mark; procedure-5marks; result-05)
(Serial dilution/ Pour plate/Spread plate/Streak plate/subculturing)
- IV. Record. 10
-
-

SCHEME OF PRACTICAL EXAMINATION
I B.Voc.,II SEMESTER: PRACTICAL- II
Microbial physiology and Metabolism

Time: 3hours

Max marks: 70

- I. Write critical notes on **A, B** and **C**
(Haemocytometer, Effect of temperature and pH, Acid and gas production from carbohydrates, Turbidimetry/spectrophotometry, Starch hydrolysis.)
- II. Demonstrate/ Perform the experiment **A** giving the principle and procedure.
Record the result. 20
(Cell counting by Haemocytometer)
(Preparation-10marks; Principle and Procedure-10 marks)
- III Demonstrate/ Perform the experiment **A** giving the principle and procedure.
Record the result. 25
(Demonstration- 10 marks; principle-5mark; procedure-5marks; result-05)
(Acid and gas production from carbohydrates, Starch hydrolysis ,Effect of temperature and pH)
- IV. Record. 10

SCHEME OF PRACTICAL EXAMINATION
II B.Voc.,III Semester
FOOD MICROBIOLOGY

Time: 3hours.

Max.marks:70

- I. Demonstrate / Perform the experiment **A**, giving principle and procedure. Record and interpret the result.
(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).
(Isolation of microorganisms from spoiled vegetables/spoiled fruits). 25
- II. Conduct the test for **B**. Write the principle and procedure. Record and interpret the results.
(Demonstration -10 marks; principle-5marks; procedure-3marks; results and interpretation-2marks). (Estimation of lactic acid in milk,Estimation of citric acid) 20
- III. Write critical notes on **C, D** and **E**. (Identification -1mark; critical comments-1marks).
(Citric acid production, Estimation of lactic acid in milk,alcohol from jaggarey) 5X3=15
- IV Record 10

.....

SCHEME OF PRACTICAL EXAMINATION
II B.Voc.,IV Semester
IMMUNOLOGY

Time:3hours

Max.marks:70

- I. Demonstrate / Perform the experiment **A**, giving principle and procedure. Record and interpret the result.
(Demonstration -10marks; principle-5marks;procedure-5marks;results and interpretation-5marks).
(Determination of blood group and Rh factor /Demonstration of RID ,ODD). 25
- II. Demonstrate the experiment **B**. write the principle and procedure. Record and interpret the results.
(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).
(Blood grouping, ODD, RID) 20
- III. Write critical notes on **C, D**, and **E**. (Identification -1mark; critical comments-1marks)
(Immune organs and immune cells) as per syllabus 5x3=15
- IV Record 10

SCHEME OF PRACTICAL EXAMINATION
III B.Voc.,V Semester
PATHOGENIC MICROBIOLOGY

Time:3hours

Max.marks:70

- I. Demonstrate / Perform the experiment **A**, giving principle and procedure.Record and interpret the result.
(Demonstration -10marks; principle-5marks; procedure-5marks;results and interpretation-5marks).
(Serological test, Biochemical test). 25
- II. Stain the given material D by.....method. Write the principle, procedure and leave the preparation for evaluation.
(Morphology- Simple staining/Gram-staining/Negative staining)
(Preparation-10marks; Principle and Procedure-10 marks) 20
- III. Write critical notes on **C, D, and E**. (Identification -1mark; critical comments-1marks)
(pathogens ,cysts,ovas of protozoa/helminths) as per syllabus 5x3=15
- IV. Record 10

.....
SCHEME OF PRACTICAL EXAMINATION
III B.Voc.,VI Semester
PATHOGENIC MICROBIOLOGY

Time:3hours

Max.marks:70

- I. Demonstrate / Perform the experiment **A**, giving principle and procedure.Record and interpret the result.
(Demonstration -10marks; principle-5marks;procedure-5marks;results and interpretation-5marks).
(Normal flora of skin, Antibiotic sensitivity test, Microbial flora off mouth-teeth crevices, Estimation of urine bacteria by calibrated loop method-Direct streak method, Evaluation of antiseptics by filter paper disk method, Determination of susceptibility to dental caries by synder test, TSIA test).
25
- II. Demonstrate the experiment **B**. write the principle and procedure. Record and interpret the results.
(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).
(Streptomycin resistant mutant strain isolation by gradient plate technique, Antibiotic sensitivity test,estimation of urine bacteria by calibrated loop method, Normal flora of skin, Antibiotic sensitivity test, Microbial flora off mouth-teeth crevices,TSIA test). 20
- III. Write critical notes on **C, D, and E**. (Identification -1mark; critical comments-1marks)
(Results of Streptomycin resistant mutant strain isolation by gradient plate technique,Antibiotic sensitivity test,estimation of urine bacteria by calibrated loop method ,Normal flora of skin,mouth-teeth autoclave, hot air oven, filter sterilization, Antibiotics as per syllabus,TSIA test,Instruments) 5x3=15
- IV .Report 10

Approved list of Paper setters

Sl No.	Name	College address
1.	Dr..M .Seema	Chairperson, Dept. of Microbiology JSS College, Ooty road, Mysore
2.	Dr..K.Sumana	Assistant prof. Dept. of Microbiology JSS College, Ooty road, Mysore
3	Dr.S.Mahadevamurthy	Associate Prof & HOD Dept. of Microbiology Yuvaraja's college Mysore.
4	Dr.Syeda Kauser Fathima	Associate Prof. of Microbiology Maharani's Science College for women JLB road Mysore.
5	Dr. H.S. Jayanth.	Asso.Prof.of Microbiology Dept. of Microbiology Yuvaraja's college Mysore.
6	Dr.Nagarathnamma	Asso. Prof. of Microbiology Government women college Mandya
7	Dr. Mashooda Begum	Asso.Prof.of Microbiology Maharani's Science College for women JLB road, Mysore.
8	Sri. M. Girish	Assistant prof. Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore
9	Dr. P.K.Maheshwar	Assistant Prof. Dept. of Microbiology Dept. of Microbiology Yuvaraja's college,Mysore.
10	Smt. M.S.Shobha	Assistant Prof, Dept. of Microbiology Maharani's Science College Mysore
11	Sri. Shankaregowda	Asso.Prof.of Microbiology Government Science College Mandya
12	Sri. R.A. Manjunath	Assistant Prof. Dept. of Microbiology Saradavilas College,Mysore
13	Dr.M.P. Ragavendra	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
14	Dr.K.Girish	Assistant Prof.

		Dept. of Microbiology Maharani's Science College, Mysore
15	Sri. G.S. Siddegowda	Assistant Prof. Dept. of Microbiology Maharani's Science College Mysore
16	Smt. M.S. Poornima	Assistant Prof. Dept. of Microbiology Yuvaraja's College, Mysore
17	Dr.N.S.Devaki	Assistant Prof. Dept. of Molecular Biology Yuvaraja's College , Mysore
18	Syeda Farahna Parveen	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore

19	Smt. Vanitha	Assistant Prof. Dept. of Microbiology Maharani's Science College, Mysore
20	Smt. Revanamba	Assistant Prof. Dept. of Microbiology Maharani's Science College, Mysore
21	Uzma Bathool	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore
22	Mahadeva prasad	Assistant Prof. Dept. of Microbiology JSS College for Women Saraswathipuram, Mysore

DEPARTMENT OF COMPUTER SCIENCE

**SEMESTER I
FPA 540**

COMPUTER SCIENCE

PAPER - I

COMPUTER FUNDAMENTALS & DOS

(2 hrs theory / week)

30 hours - 2 Credits

CO1.Master the basic knowledge of applications of MS office package

CO2.Get the skill of office productivity tool

CO3.Learn the usage of internet

CO4.Skill to develop program using C language

SECTION- I

15 Hours

INTRODUCTION

Computer, Characteristic of Computer, History of Computer, Generation of Computers, Components of Computer and Applications of Computers.

Key Factors of Computers: Hardware, Software - types of Software (Application and system), forms of software (firmware, shareware, freeware), Translator - Assembler, Compiler and Interpreters. Computer Application – Business, Scientific, Entertainment and educational.

CLASSIFICATION OF COMPUTERS

Mode of operations – Analog, Digital and hybrid Computers.

Size and capabilities – Micro, Mini, Main frame and Super computer.

MEMORY UNITS

Primary memory - RAM, ROM, PROM, EPROM, EEPROM, Flash memory, cache memory.

Secondary memory – Magnetic disk (Hard disk, Floppy disk, Zip disk, Jaz disk, Super disk), Optical disk (CD, CD – R, CD – RW, DVD).

COMPUTER PERIPHERALS DEVICES AND INTERFACES

Input devices – Working principle of Keyboard and mouse, Functional capabilities of Scanner, Digital Camera, OMR, OCR, touch pad, touch screen. Output Devices – Monitor, Printer, Plotter and projector.

PROGRAMMING LANGUAGES

Machine, Assembly language and High Level Language.

INFORMATION SYSTEM

Data and Information, types of information, what is an information System, Types of Information Systems – System development life cycle.

SECTION- II

15 Hours

OPERATING SYSTEM AND THE USER INTERFACE

Operating System– Functions, services, Types-Batch, Single, Multiprogramming, and Multiprocessing.

Operating System – the user interface –running programs –managing hardware –enchaining the operating system with utility software- typical operating systems in use

COMPUTERS AND COMMUNICATION

Single user, multi-user, workstation, and client server systems. Computer networks, Types of Network LAN, WAN, Internet, Internet applications, WWW, Email, FTP, web browsers (Internet explorer, Google Chrome, Mozilla).

DISK OPERATING SYSTEM (Dos)

Introduction, History & version of DOS. DOS basics – physical structures of disk, drive, Name, FAT, File & Directory structure and Naming Rules, Booting Process, DOS System files, role of config.sys file.

DOS COMMANDS

Internal – DIR, MD, CD, RD, COPY, DEL REN, VOL, DATE, TIME, CLS, PATH, TYPE etc.

External – CHKDSK, XCOPY, PRINT, DISK COPY, DISKCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB, HELP, SYS, WILD CARD Characters etc.

Executable V/S Non executable Files in DOS.

TEXT BOOKS:

- Peter Norton’s ‘Introduction to Computers’, Second Edition, TMH
- Computer Fundamentals – P K Sinha, BPB

REFERENCE BOOKS :

- Introduction to Computers – N Subramanian, TMH
- Understanding Computers – R Rajagopalan. TMH
- Computers Today – Donald Sanders, MGH

Practical

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

**SEMESTER II
COMPUTER SCIENCE**

FPB 550

**PAPER – II
PROGRAMMING IN C
(2 hrs theory / week)**

30 hours - 2 Credits

CO1.Master the basic knowledge of applications of MS office package

CO2.Get the skill of office productivity tool

CO3.Learn the usage of internet

CO4.Skill to develop program using C language

SECTION-I

15 Hours

PROBLEM SOLVING TECHNIQUES

Problem Definition, Problem Analysis, Design of problem solutions and use of design tools, Algorithm, Flowcharts, Coding, Testing, Debugging, Program documentation.

INTRODUCTION TO C LANGUAGE

History Features and Applications of 'C', Structure of C Program.

PROGRAMMING PRELIMINARIES

Character set, definitions and declarations of identifiers, Variables, Escape Sequence Characters. Constants, Keywords, Data types with examples.

OPERATORS AND EXPRESSIONS

Various operators and expressions, Operator precedence with example programs.

INPUT-OUTPUT STATEMENTS

Various types of standard input output statements, standard mathematical functions, with example programs.

SECTION - II

15 Hours

CONTROL STRUCTURES

Decision makes and branching statements, Decisions making and looping statements, break statement, continue statement and goto statement with example programs.

ARRAYS

Definitions and need of arrays, 1-d and 2-d arrays with example programs, introduction to multidimensional arrays.

STRING HANDLING

Declarations, Initialization, reading and writing of strings, operations and string functions with example programs, array of pointers to strings.

FUNCTIONS

Definitions and need of functions. Library functions, user defined functions in detail, function declaration and prototypes call by value, call by reference and functions and arrays, recursion, storage classes with example program.

STRUCTURE

Definition of structure, Array in Structures, Structure with Array, Difference between array and structure

TEXT BOOKS:

- Programming with ANSI C by: E. Balagurusamy

REFERENCE BOOKS :

- Let us C - Yashwanth kanetkar
- Computer concepts and C programming by - P. B. Kotur
- The Complete Reference C by Herbert Schildt

Practical

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Scheme of Examination

Sl. No	Semester	Paper	Marks for theory	Marks for internal assessment		Total
				C1 = 15	C2 = 15	
1	I	COMPUTER FUNDAMENTALS & DOS	70	C1 = 15	30	100
				C2 = 15		
2	II	PROGRAMMING IN C	70	C1 = 15	30	100
				C2 = 15		

Distribution of Internal assessment

- 1) CLASS TEST (C1) -15 MARKS. }
 2) CLASS TEST (C2) -15 MARKS. } = 30 marks

Scheme of Practical Examination

Sl. No	Semester	Paper	Marks for Practical	Marks for Record	Marks for Viva	Total
1	I	COMPUTER FUNDAMENTALS & DOS	60	05	05	70
2	II	PROGRAMMING IN C	60	05	05	70

Pattern of Question Paper for B.Voc

**Semester I
COMPUTER SCIENCE**

Time : 2 Hrs 30 Mins

Max Marks 70

1. Answer all the questions in one sentence or a word

5 X 1 = 5

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

2. Tick the correct answer

5 X 1 = 5

- f. -----
- g. -----
- h. -----
- i. -----
- j. -----

3. State whether the following statements are true or false

5 X 1 = 5

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

4. Fill in the blanks with suitable answers

5 X 1 = 5

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

5. Answer any ten of the following questions

10 X 3 = 30

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----
- f. -----
- g. -----
- h. -----
- i. -----
- j. -----
- k. -----

l. -----

6. Answer any four questions of the following

4 X 5 = 20

- a. -----
- b. -----
- c. -----
- d. -----
- e. -----

**Pattern of Question Paper for B.Voc
Semester II
COMPUTER SCIENCE**

Time : 2 Hrs 30 Mins

Max Marks 701. Answer

all the questions in one sentence or a word

10 X 1 = 10

- f. -----
- g. -----
- h. -----
- i. -----
- j. -----
- k. -----
- l. -----
- m. -----
- n. -----
- o. -----

5. Answer any four of the following questions

4 X 5 = 20

- f. -----
- g. -----
- h. -----
- i. -----
- j. -----

6. Answer any four questions of the following

4 X 10 = 40

- f. -----
- g. -----
- h. -----
- i. -----
- j. -----
- k. (Note- 10 Marks may be divided in to 6+4 or 5+5

FPA 020

À»vÀå WÀIPÀ

12 UÀAmÉUÀ¼ÀÄ

1. PÀªÀå

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| 1. AiÀiÁªÀ PÀ@zÀ ±Á,ÀÛçªÉÉÅÅ °ÉÅ½zÀgÉÉÅÅ? | - PÀªªÉAªÀ |
| 2. ¢ÀÄIÖ «zsÀªÉ | - ¨ÉÄzÉæ |
| 3. gÀAUÉÆÅ° | - ¢ÀÄwÅ |
| 4. ¢ÀÄªª¨ÉÉ eÁvÀPÀ | - fJ,ïJ,ï |
| 5. CqÀÄUÉ ¢ÀÄÉÉAiÀÄ °ÀÄqÀÄV | - ¢ÉÉzÉÅ» |
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2. UÀzÀå

12 UÀAmÉUÀ¼ÀÄ

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| 2. ¢ÀiÁ»w vÀAvÀæeÁÖÅ : MAzÀÄ,ÀÆÛ® ÅÉÆÄI | - f.JÆï. ÅgÀ¹A°ÀªÄÆwð |
| 3. ¢ÀÄÆqsÀÅA©PÉUÀ¼À ©ÄrÅ°è | - ¨sÀªªÅÉÉ±Àéj°ÉUÀqÉ |
| 4. ¨ÉÄqÀzÀ CwyUÀ¼ÀÄ | - J JÆï ¢ÀÄÆwðgÀAiÀÄgÀÄ |

¨sÀµÀ WÀIPÀ

3. DqÀ½vÀ ¢ÀÄvÀÄÛ ¢ÀtÀdÀª PÀÅÀßqÀ

21 UÀAmÉUÀ¼ÀÄ

- DqÀ½vÀ ¨sÀµÉAiÀiÁV PÀÅÀßqÀ,ÀégÀÆª ¢ÀÄvÀÄÛ ©PÀët
- ,ÀPÀðj ¢ÀvÀæ,ÀégÀÆª - CçüPÀÉvÀ eÁÖªÅÅ ¢ÀÄvÀÄÛ,ÀÄvÉÆÛÄ¨É
- «zsÀ jÅwAiÀÄ CfðUÀ¼ÀÄ - gÀeÉ, ¢ÉÄvÀÅÅ, §rÛ, ¢ÀzÉÆÅÅÅßw EvÀgÉ
- ¢ÀtÀdª PÀÅÀßqÀzÀ,ÀégÀÆª ¢ÀÄvÀÄÛ ©PÀët
- ¢ÀtÀdª ¢ÀvÀæzÀ «zsÀ CAUÀUÀ¼ÀÄ
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ªÀjzÀAiÀÄ ¢ÀvÀæ, ¢ÀgÀªª±ÀðÅ ¢ÀvÀæ, ¢Àªª°ÀgÉÆÄfÓªªÅÅ ¢ÀvÀæ, ¢ÀjªvÀæ
- UÀtPÀzÀ°è PÀÅÀßqÀ - PÀÅÀßqÀzÀ CAVÀeÁð® vÀtUÀ¼ÀÄ- ÅÄr, §gÀ°À- ¢Àj¨sÀ¶PÀ
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| 2. ©AzÀÄ ©AçUÉ | - ¢ÉÉzÉÅ» |
| 3. ¢ÀQèPÀ² | - PÀªªÉAªÀ |
| 4. ,ÀªªUÀæPÀªÀå | - ¨ÉÄzÉæ |
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| 6. ¢Àªª°ÀjPÀ PÀÅÀßqÀ | - JZï J,ï PÉ |
| 7. DqÀ½vÀPÀÅÀßqÀ | - qÀ C±ÉÆÄPïPÀªªAiÀgï gÀAeÉgÀ |

8. PÀbÉĀj PÉĒir - PÄÄªÉA¶ÄÄ PÄŁÄßqÄ CzsÄâAiÄÄŁÄ ,ÄA,ÉÜ
9. - ÉĀŁÄPÄĒ É - J,ĭ ¶ÄæªÄèzÄgÄĀĭ
10. DqÄ½vÄĒsÄµĒ PÉªÄÄ «ªÄgÄUÄ¼ÄÄ - ¶ÄæzsÄŁÄ UÄÄgÄÄzÄvÄÜ

B.Voc Programme

**Language kannada
I Semester**

¶Äæ±Éß¶ÄwæPÉ ,ÄégÄŁE¶Ä

3.00 UÄAmÉUÄ¼ÄÄ

70 CAPÄUÄ¼ÄÄ
«ĒsÄUÄ-1

1. ĒsÄªÄxÄð §gÉ-Āj : 1óó*5=5
C)

CxÄªÄ

D)

2. ,ÄAzÄĒsÄð ,Ä»vÄ «ªÄj¹ 1óó*5=5
C)

CxÄªÄ

D)

3. PÉ¼ÄVŁÄ ¶Äæ±ÉßUÉ GvÄÜj¹: 1*10=10
C)

CxÄªÄ

D)

«ĒsÄUÄ-2

5. PÉ¼ÄVŁÄ ¶Äæ±ÉßUÉ GvÄÜj¹: 1óó*10=10
C)

CxÄªÄ

D)

5. PÉ¼ÄVŁÄ ¶Äæ±ÉßUÉ GvÄÜj¹: 1*10=10
C)

CxÄªÄ

D)

«ĒsÄUÄ-3

6. LzÄPÉĭ n¶ÄàtÄ §gÉ-Āj: 3*5=15
C)

CxÄªÄ

D)

7. PÉ¼ÄVŁÄ ¶Äæ±ÉßUÉ GvÄÜj¹: 1*10=10
C)

CxÄªÄ

D)

9. PÄŁÄßqÄPÉĭ ĒsÄµÄAvÄj¹: 1*5=5

10. EAVèŕUÉ ĒsÄµÄAvÄj¹: 1*5=5

FPB540

**B.Voc- II Semester
Communicative English**

No. of Credits : 3

No. of Instruction hrs : 3 / Week(45 hrs)

- AIMS:** 1) To familiarize students to basic English
2) To enable them to develop listening & speaking skills

OBJECTIVES: Students should be able to ____

- 1) Write English without grammatical errors
- 2) Speak English Language effectively and accurately
- 3) Listen and understand public announcements and news on TV & Radio

Module – 1 Grammar

	Marks	Hrs/ Week
1. Subject and Verb Agreement	5	6
2. Voice	5	5
3. Articles	5	3
4. Speech	5	6
5. Question tag	5	5
6. Framing of Questions	5	Q=05

Module – 2 Writing Skills

1. Letter Writing Letter of Application/Letter of Grievances/Resume Preparation	10	4
2. Comprehension	10	3
3. Essay Writing	10	3

Module – 3 Speaking Skills

1. Greeting		
2. Requesting		
3. Enquiring		
4. Explaining	10	Q=05
5. Reporting		
6. Permission		
7. Thanking		

70 45

PAPER CODE :FPB540

**B.Voc II SEMESTER
COMMUNICATIVE ENGLISH**

MODEL QUESTION PAPER

TIME: 3 Hrs

MAX MARKS: 70

Instructions to students: All sections are compulsory.

SECTION A

I Fill in the blanks with correct form of verbs:

5 X 1 = 05

- a) Slow and Steady _____ the race.(to win)
- b) Christians _____ to church on Sundays. (to go)
- c) They have _____ the work. (to complete)
- d) He _____ absent yesterday. (to be)
- e) We _____ learning grammar now. (to be)

II Change the voice of the following sentences:

5 X 1 = 05

- a) He is writing a poem.
- b) We have won the match.
- c) The poet took the second road.
- d) A song will be sung by her.
- e) Close the door.

III Fill in the blanks with suitable article:

5 X 1 = 05

- a) My father is _____ MLA.
- b) _____ earth moves round the sun.
- c) The poet rejected _____ first road.
- d) The Nile is _____ long river.
- e) Brutus was _____ honest man.

IV Change the speech of the following:

5 X 1 = 05

- a) The King said to people," I am happy to be here".
- b) Mother said to the child," Don't go near water".
- c) Raju asked Rosie who she was.
- d) Velan said to Venu," Why are you crying?"
- e) The lady told the writer that he was very humorous.

V Add question tag to the following:

5 X 1 = 05

- a) He is a good singer.
- b) The poet observed the daffodils.
- c) Behrman saves the life of Johnsy.
- d) English is not a difficult language.
- e) India has won the second test.

VI Frame questions so as to get the underlined words as answers:

5 X 1 = 05

- a) Shakespeare wrote 'Macbeth'
- b) Rama killed Ravana.
- c) He goes to college by car.
- d) The College starts at 10.30 am

e) Lear's daughters were selfish.

SECTION B

P.T.O

VII Letter Writing:

10 X 1 = 10

- a) **Write a letter of application to the post of a Computer Programmer at SkillTec Ltd. Mysuru**
OR
b) **Prepare your resume.**

VIII Read the following essay carefully and answer the questions set on it:

5 X 2 =10

I was wrong to think that city life is altogether unhealthy. Perhaps it was so at one time, now a days with proper roads, pavements and drainage systems, sickness is kept at bay. Cities are planned in such a way as to provide open space with parks and playgrounds for the benefit of the dwellers.

Even when sickness does strike, there are doctors and hospitals near at hand. This is not the case in the country where people frequently suffer and sometimes die for want of medical facilities.

- 1) What does the writer think of the city life?
- 2) What causes sickness?
- 3) Where do you find doctors and hospitals in plenty?
- 4) How does the passage distinguish between city and country life?
- 5) Give a suitable title to the passage.

IX Write an essay on one of the following:

10 X 1 = 10

- a) Use and abuse of social media.
- b) Role of students in nation building
- c) Afforestation?

X Answer the following:

5 X 2 = 10

1. Write an imaginary conversation between a customer and Bank Manager regarding opening an account.
2. Write a dialogue between two friends who meet after a long time.

**B.Voc II SEMESTER
COMMUNICATIVE ENGLISH
QUESTION PAPER SCHEME**

TIME: 3 Hrs

MAX MARKS: 70

Instructions to Students: All sections are compulsory.

SECTION A

- I Fill in the blanks with correct form of verbs 5 X 1 = 05
a)
b)
c)
d)
e)
- II Change the voice of the following sentences 5 X 1 = 05
a)
b)
c)
d)
e)
- III Fill in the blanks with suitable article 5 X 1 = 05
a)
b)
c)
d)
e)
- IV Change the speech of the following 5 X 1 = 05
a)
b)
c)
d)
e)
- V Add question tag to the following 5 X 1 = 05
a)
b)
c)
d)
e)
- VI Frame questions so as to get the underlined words as answers 5 X 1 = 05
a)
b)
c)
d)
e)

SECTION B

- VII 10 X 1 = 10
1. Write a letter of application
OR
2. Prepare a Resume.
- VIII Read the following essay carefully and answer the questions. 10 X 1 = 10

- a)
- b)
- c)
- d)
- e)

IX Write an essay on one of the following:

10 X 1 = 10

- a)
- b)
- c)

X Answer the following :(Dialogue writing)

5 X 2 = 10

- 1)
- 2)

UNIT I **08 hrs**

- a) Preamble of the Indian Constitution
- b) Salient features of Indian Constitution

UNIT II **10 hrs**

- a) Fundamental Rights
- b) Fundamental Duties
- c) Directive principles of State Policy

UNIT III **14 hrs**

- a) President – Election Method, Powers and Functions
- b) The Role of the Prime Minister
- c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)
- d) Supreme Court – Organization and Jurisdiction

UNIT IV **13 hrs**

- a) The Role of Governor in the Administration of State
- b) Powers and Functions of the Chief Minister
- c) Composition , Powers and Functions of both the Houses of State Legislature
- d) High Court – Organization and Jurisdiction

TEXT BOOKS

- An introduction to the Constitution of India by M V Pylee
- Introduction to the Constitution of India by D D Basu
- Understanding the Constitution of India by Dr. H M Rajashekar
- Indian Constitution by Sommanna, Brahamananda, H B Mallikarjuna swamy,
- Indian Constitution by H T Ramakrishana, Rajiv

Sl. no.	Information Communication Technology	Hrs
1	The humanitarian supply chain – Definition, system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer	5
2	Technology framework – Front-end services, Middleware services and Infrastructure services: Supporting the food assistance supply chain; Mapping technologies; Web portals	5
3	Mobile technologies - Combining hand-held and wireless communications technologies	5
4	Beneficiary identification - Challenges in food assistance to ensure that assistance goes to the right beneficiaries	5
5	ICT in emergencies – Requirement inputs of Food assistance interventions during emergencies	5
6	Linking the humanitarian supply chain - Ways in which WFP uses technology and technological techniques to fulfill its role as the provider of food assistance in development and emergencies	5

Sl. no.	Practical	Hrs
1.	Identification of software related to Food Processing and Engineering	3
2.	Practicing the use of software	6
3.	Requirement development for Food Processing Software	6

INFORMATION AND COMMUNICATION TECHNOLOGY

TIME: 3 hrs

Max marks: 70

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

I. Write short notes for the following(any 5): (5x2=10)

- 1. -----
- 2. -----
- 3. -----
- 4. -----
- 5. -----
- 6. -----

PART-B

II. Answer any 4 of the following: (4x5=20)

- 1. -----
- 2. -----
- 3. -----
- 4. -----
- 5. -----

PART -C

III. Answer any 4 of the following: (4x10=40)

- IV.**
- 1. -----
 - 2. -----
 - 3. -----
 - 4. -----
 - 5. -----

INFORMATION AND COMMUNICATION TECHNOLOGY

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Identification of software related to Food Processing and Engineering.
2. Practicing the use of software.
3. Requirement development for Food Processing Software.

Environmental Studies (One-Semester Compulsory Core Module for B.Voc Programmes)

Unit 1: Environment and natural systems

4 hrs

- Introduction to Environment and Environmental Studies
- Definition and Components of Environment, Relationship between the different components of Environment
- Man and Environment relationship
- Impact of technology on Environment, Environmental Degradation
- Multidisciplinary nature of the Environment studies
- Its scope and importance in the present day Education System

UNIT 2: Ecology and Ecosystems:

7 hrs

- Introduction: Ecology- Objectives and Classification
- Concept of an ecosystem- structure and functions of ecosystem
- Components of ecosystem- Producers, Consumers, Decomposers
- Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs ,Ecological Pyramids
- Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem.

Unit 3: Natural Resources

7 hrs

Renewable and Nonrenewable resources, exploitation and conservation,

- Water resources: Surface and Ground water sources, Indian and Global scenario.
Land as a resource, land use change and land degradation
- Forest resources: Definition and Classification of Forests
Ecological and Economic importance and benefits of forest, Indian scenario,
Deforestation: causes and effects, case studies remedial measures
- Food resources: Sources of food, Global and Indian food demand scenario,
Limits of food production, Environmental effects of Agriculture
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies
- Mineral resources: Definition and Classification of minerals, mining issues Case studies.
- Role of individual in conservation of natural resources.

Unit 4 : Biodiversity and its Conservation

6 hrs

- Biodiversity : Definition, Levels of biological diversity : genetic, species and ecosystem diversity
- Biogeographic zones of India
- Hot spots of biodiversity
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values
- Biodiversity patterns
- India as a mega-biodiversity nation

- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 5: Environmental pollution:

9 hrs

- Types of Environmental Pollution:
- Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication.
- b) Marine pollution: Causes, effects and control.
- c) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO₂, NO_x, Natural & Anthropogenic Sources, Effects of common air pollutants
- d) Soil Pollution: causes, effects and control.
- e) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects
- f) Thermal Pollution: Causes, effects and control.
- g) Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Role of individual in the prevention of pollution, Pollution case studies.

UNIT 6: Sustainable development and Environmental issues and Policies.

7 hrs

- Sustainable development: Meaning, changes in resource utilization, urbanization.
- Water conservation: watershed management and Rain water harvesting.
- Environmental issues: Climate change, global warming, acid rain, ozone layer depletion.
- Disaster management: floods, drought, earthquake, cyclones and landslides.
- Wasteland reclamation.
- Environment Protection Act: Air, Water, Wildlife (Prevention and Control of Pollution)
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Environment: rights and duties.

Unit 7 : Human Population and the Environment

5 hrs

- Population growth, Explosion, demographic variation among nations.
- Family welfare Program.
- Environment, human health and welfare; infectious and lifestyle diseases in contemporary world.
- Value Education: Environmental ethics.
- HIV/AIDS
- Women and Child welfare.
- Role of information technology in Environment and human health

Unit 8: Field visit

5 hrs

- Field work Visit to an area to document environmental assets :river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Visit to the solid waste treatment plant and water treatment plant.
- Video: The one degree • (Equal to 5 lectures)

REFERENCE BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani, 2013 Publisher: LAP -Lambert Academic Publishing, Germany
3. Environmental Studies by Anindita Basak, 2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.
10. Environmental Studies by N.Arumugam & V.Kumaresan, saras publication.

Scheme of Examination

Sl. No	Semester	Paper	Marks for theory	Marks for internal assessment	Total
1	Even sem	Environmental studies	70	30	100

ENVIRONMENTAL STUDIES (ONE-SEMESTER COMPULSORY CORE MODULE FOR B.VOC PROGRAMMES)

Scheme of examination

Question paper pattern

Sl.no	Types of questions	Marks	No. of questions	Total marks
1	Short notes	2	5	10
2	Medium type	5	4	20
3	Long answers	10	4	40
			Total	70 marks

Distribution of Internal assessment

- 3) ASSIGNMENT/SEMINAR-15 MARKS.**
- 4) CLASS TEST-15 MARKS.**

TIME: 3 hrs

Max marks: 70

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

V. Write short notes for the following(any 5): (5x2=10)

- 7. -----
- 8. -----
- 9. -----
- 10. -----
- 11. -----
- 12. -----

PART-B

VI. Answer any 4 of the following: (4x5=20)

- 6. -----
- 7. -----
- 8. -----
- 9. -----
- 10. -----

PART –C

VII. Answer any 4 of the following: (4x10=40)

- 6. -----
- 7. -----
- 8. -----
- 9. -----
- 10. -----

Sl. no.	Biostatistics	Hrs
1.	Statistical concepts: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart etc.	4
2.	Measure of Central Frequency: Mean, median, mode.	2
3.	Measure of dispersion of data: Range, semi-interquartile range, mean deviation, standard deviation, standard error, coefficient of variation, confidence limits.	5
4.	Types of distribution of data: Normal, Binomial, Poisson.	7
5.	Z-test, t-test, ANOVA, multiple comparisons, LSD and DMRT, Chi-square test.	4
6.	Regression estimate, correlation coefficient.	4
7.	Experimental designs, data transformation.	4

Sl. no.	Practical	Hrs
1.	Analytical Problems / calculations	15

MODEL QUESTION PAPER

Semester-IV

CODE NO: FPD 580

BIOSTATISTICS

TIME: 3 hrs

Max marks: 70

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

VIII. Write short notes for the following(any 5): (5x2=10)

- 13. -----
- 14. -----
- 15. -----
- 16. -----
- 17. -----
- 18. -----

PART-B

IX. Answer any 4 of the following: (4x5=20)

- 11. -----
- 12. -----
- 13. -----
- 14. -----
- 15. -----

PART –C

X. Answer any 4 of the following: (4x10=40)

- XI.**
- 11. -----
 - 12. -----
 - 13. -----
 - 14. -----
 - 15. -----

IV SEMESTER PRACTICAL EXAMINATION

**BIostatISTICS
PRACTICAL
SCHEME OF EXAMINATION**

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

4. Analytical Problems / calculations.

Model Curriculum

Fruit Pulp Processing Technician

SECTOR: FOOD PROCESSING
SUB-SECTOR: FRUITS & VEGETABLES
OCCUPATION: PROCESSING
REF ID: FIC/Q0106, V1.0
NSQF LEVEL: 4



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/Qualification Pack: **'Fruit Pulp Processing Technician'** QP No. **'FIC/Q0106, NSQF Level 4'**

Date of Issuance: **January 15, 2016**

Valid up to: **July 02, 2016**

* Valid up to the next review date of the Qualification Pack



Madika Verma

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

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Fruit Pulp Processing Technician

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Fruit Pulp Processing Technician”, in the “Food Processing” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Fruit Pulp Processing Technician		
Qualification Pack Name & Reference ID. ID	FIC/Q0106, v1.0		
Version No.	1.0	Version Update Date	12/01/2016
Pre-requisites to Training	Preferably Class 8 and 2-3 years’ experience in a food processing unit		
Training Outcomes	The programme will help in building the following key competencies amongst the learner: <ul style="list-style-type: none"> • Process fruits to produce fruit pulps manually or through machine operation; • Plan, organize, prioritize, inspect, and calculate production requirements; • Maintain process parameters to achieve the desired quality and quantity; • Follow and maintain food safety and hygiene in the work environment 		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of “Fruit Pulp Processing Technician” Qualification Pack FIC/Q0106, Version 1.0 issued by Food Industry Capacity and Skill Initiative”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction to the training program Theory Duration (hh:mm) 00:30 Practical Duration (hh:mm) 00:00 Corresponding NOS Code Bridge Module	<ul style="list-style-type: none"> Introduce each other and build rapport with fellow participants and the trainer. 	White board/Chart papers, marker
2	Overview of the “Fruit Pulp processing technician” Role Theory Duration (hh:mm) 01:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	<ul style="list-style-type: none"> Understanding the roles and responsibilities of fruit pulp processing technician Awareness of the nature and availability of job opportunities 	Laptop/computer white board, marker, projector, chart papers
3	Introduction to the Food Processing Industry Theory Duration (hh:mm) 01:30 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	<ul style="list-style-type: none"> Define food processing List the various sub sectors of food processing industry 	Laptop, white/black board, marker, chart papers, projector, Trainer’s guide, Student manual
4	Introduction to Fruit & Vegetable Processing Theory Duration (hh:mm)	<ul style="list-style-type: none"> State the need for fruit and vegetable processing State the common methods of fruit and vegetable processing 	Laptop, white/black board, marker, chart papers, projector, trainer’s guide, student handbook, pictures/charts of

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	02:00 Practical Duration (hh:mm) 01:00 Corresponding NOS Code		different subsectors in fruit and vegetable processing e.g. pickle, jam and jelly, ketchup, juices, squashes, fruit pulp etc.
5.	Overview of Fruit Pulp Processing Theory Duration (hh:mm) 03:00 Practical Duration (hh:mm) 01:00 Corresponding NOS Code FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123	<ul style="list-style-type: none"> Define fruit pulping List the various fruits used for pulping Describe the pulping process 	Laptop/computer white board, marker, projector, chart papers, Trainer's guide , student handbook
6.	Organizational standards and norms Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 01:00 Corresponding NOS Code FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123 FIC/N9001	<ul style="list-style-type: none"> State the roles and responsibilities of a jam, jelly and ketchup processing technician State how to conduct yourself at the workplace State the personal hygiene and sanitation guidelines State the food safety and hygiene standards to follow in an organization 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
7.	Prepare and Maintain Work Area and Process Machineries for pulp processing Theory Duration (hh:mm)	<ul style="list-style-type: none"> Identify different equipments used in fruit pulp processing State the materials and equipments used in cleaning and maintenance of the work area and machineries State the cleaning processes used to clean the work area 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, authorized sanitizers, cleansers, all equipments for demonstration

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	08:00 Practical Duration (hh:mm) 15:00 Corresponding NOS Code FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123 FIC/N9001	<ul style="list-style-type: none"> • Demonstrate the use of different tools and machineries used for squash and juice • Demonstrate the appropriate method for cleaning and maintain a work area Ensure the work area is safe and hygienic for food processing • Identify and set the machines and tools required for production in working condition • Maintain cleanliness of the process machineries required for production using recommended sanitizers 	
8.	Food Microbiology Theory Duration (hh:mm) 06:00 Practical Duration (hh:mm) 02:00 Corresponding NOS Code	<ul style="list-style-type: none"> • State the types of food microbes • State the causes of food spoilage • State the process of food spoilage state the criteria to check food spoilage • State the need for food preservation • State different types of food preservation processes • Explain the method of assessing the quality of produce based on physical parameters 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, samples of fresh and spoiled food
9..	Prepare for production of fruit pulp Theory Duration (hh:mm) 06:00 Practical Duration (hh:mm) 12:00 Corresponding NOS Code FIC/N0121 FIC/N0122	<ul style="list-style-type: none"> • Use basic mathematics for various calculations in day-to-day processes • Plan the production schedule as per organizational standards and instructions • Organize for raw materials, packaging materials, manpower, equipment and machineries for the scheduled production • Identify the raw materials required for production as per production schedule and formation • State the methods for storing raw materials for later use • Plan the production sequence to maximize capacity, utilization of resources, manpower and machinery • Calculate batch size and prioritize urgent orders based on the production schedule and machine capacity 	SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives;

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • Check the conformance of raw material quality to company standards • Organize quality raw material as per production process and company standards • Check the raw material quality and grade • Prepare the raw material for production • List the effect on pulp of manhandling fruits 	Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer; seam checking gauge; bottle brush washer;
10.	Produce fruit pulp from various fruits Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm) 20:00 Corresponding NOS Code FIC/N0122	<ul style="list-style-type: none"> • Explain the process of pulping fruit • Define ripening • Explain fruit ripening process • Demonstrate the process of ripening, sorting, and deseeding fruit • State the procedures used to create the fruit pulp • Demonstrate the process of fruit pulping • State the methods of sterilizing fruit pulp • List the quality control parameters for checking fruit pulp • State the basic categories of packing • State the various types of packaging materials used for packing fruit pulp • State the factors for selecting packaging materials • Explain aseptic packaging in fruit processing industry • Define canning and its purpose • State the process of canning • Demonstrate the canning process of fruit pulp • State the methods for storing raw materials for later use • Explain the process of storing packaged fruit pulp • State the process of maintaining storage conditions • Demonstrate the process of cleaning the work area and machineries after production organizational standards 	SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives; Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and

Sr. No.	Module	Key Learning Outcomes	Equipment Required
			vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer seam checking gauge; bottle brush washer; protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
11.	Complete documentation and record keeping Theory Duration (hh:mm) 03:00 Practical Duration (hh:mm) 01:00 Corresponding NOS Code FIC/N0123	<ul style="list-style-type: none"> State the need for documenting and maintaining records of raw materials, processes and finished products State the method of documenting and recording the details of raw material to final finished product Document daily records in the ERP system effectively 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.
12.	Food Safety, Hygiene and Sanitation Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 04:00 Corresponding NOS Code FIC/N9001	<ul style="list-style-type: none"> State the importance of safety, hygiene and sanitation in the baking industry Follow the industry standards to maintain a safe and hygiene workplace Follow HACCP principles to eliminate food safety hazards in the process and products Follow safety practices in the work area 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth covers, sanitizer, safety manual, logbooks etc.
13.	Professional and Core Skills Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 00:00	<ul style="list-style-type: none"> Undertake a self-assessment test Identify personal strengths and weaknesses Plan and schedule the work order and manage time effectively to complete the tasks assigned Prevent potential problems from occurring Resolve issues and problems using acquired knowledge and realize the importance of decision making 	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code	<ul style="list-style-type: none"> Identify potential problems and make sound and timely decision Improve your reading skills State the importance of listening 	
14.	IT Skills Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 08:00 Corresponding NOS Code	<ul style="list-style-type: none"> Identify parts of the computer Use the computer keyboard effectively to type Use computer applications effectively to record day-to-day activities Use the word processor effectively Use the spreadsheet application effectively Use the computer to document day-to-day activities 	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
15.	Field Visits Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 19:00 Corresponding NOS Code	<ul style="list-style-type: none"> Observe the factory location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in pickle processing Observe the various machineries used in pickle processing Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry 	All the tools and equipment listed above must be available at the site of field visit
16.	Revision Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 01:00 Corresponding NOS Code	<ul style="list-style-type: none"> Revised the knowledge gained so far 	All the tools and equipment listed above must be available at the time of revision
17.	Evaluation Theory Duration (hh:mm) 08:00	<ul style="list-style-type: none"> Assess the knowledge and skills acquired by the participants 	All the tools and equipment listed above must be available for evaluation

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 10:00 Corresponding NOS Code		
18.	On-the-job Training Theory Duration (hh:mm) 14:00 Practical Duration (hh:mm) 50:00 Corresponding NOS Code	<ul style="list-style-type: none"> Apply the skills and knowledge acquired in the training program in the field 	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration 240:00 Theory Duration 95:00 Practical Duration 145:00	Unique Equipment Required: SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives; Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer seam checking gauge; bottle brush washer	

Grand Total Course Duration: **240Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [SSC: Food Industry Capacity and Skill Initiative](#))

Trainer Prerequisites for Job role: “Fruit Pulp Processing Technician” mapped to Qualification Pack: “FIC/Q0106, v1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “FIC/Q0106”, Version 1.0
2	Personal Attributes	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	Minimum Educational Qualifications	<ul style="list-style-type: none"> B.Sc/B.Tech/BE in Food Technology or Food Engineering with 2-3 years of hand on experience in a Pulping Unit or Fruits/Vegetables Processing Unit.
4a	Domain Certification	Certified for Job Role: “Fruit Pulp Processing Technician” mapped to QP: “FIC/Q0106, v1.0”. Minimum accepted score is 80%
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/Q1402”. Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	Experience	<ul style="list-style-type: none"> B.Sc/B.Tech/BE in Food Technology or Food Engineering with 2-3 years of hand on experience in a Pulping Unit or Fruits/Vegetables Processing Unit.

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Fruit Pulp Processing Technician
Qualification Pack	FIC/Q0106, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/Q0120: Prepare and maintain work area and process machineries for pulp processing	PC.1 Prepare, clean and maintain the cleanliness of the work area using approved sanitizers and keep it free from dust, waste, flies and pests	100	25	10	15
	PC2. Ensure that the work area is safe and hygienic for food		10	3	7
	PC3. Dispose waste materials as per defined SOPs and industry requirements		15	5	10
	PC4. Check the working and performance of all machineries and tools used for the pickle making process such as washer, peeler, vegetable cutter/slicer, blender, packaging machines etc.		15	5	10
	PC5. Clean the machineries and tools used with approved sanitizers following SOP		15	5	10
	PC6. Place the necessary tools required for process		5	2	3
	PC7. Attend the minor repairs/ faults of all machines, if required		15	5	10
	Total		100	35	65
2. FIC/Q0121: Prepare for production of fruit pulp	PC1. Read and understand the production order from supervisor	100	10	4	6
	PC2. Check the availability of raw materials, packaging materials, equipment availability and manpower		5	2	3
	PC3. Support in planning production sequence		15	5	10
	PC4. Calculate the batch size based on the production order and machine capacity		5	2	3
	PC5. Calculate the raw material requirement (considering the process loss) to produce the required quantity of finished		5	2	3
	PC6. Calculate the raw materials, packaging materials and manpower requirement for completing the order.		5	2	3
	PC7. Ensure the working and performance of each equipment required for the process		7	2	5
	PC8. Calculate the process time for effective utilization of machineries		7	2	5
	PC9. Plan batch size considering full capacity utilization of machineries		3	1	2
	PC10. Plan to utilize machineries for multiple products without affecting the quality of		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	the finished products, and to optimize production and save energy				
	PC11. Allot responsibilities and help to assistants and workers		5	1.5	3.5
	PC12. Refer the process chart for products produced		3	1	2
	PC13. Weigh the raw materials required for the batch		3	1	2
	PC14. Check the conformance of raw material quality to organization standards, through physical analysis and by referring the quality analysis report from the supplier/ internal lab analysis report		10	4	6
	PC15. Sharpen cutter blades and change the cutter/slicer blades		2	0.5	1.5
	PC16. Fix, change, clean filters and sieves of processing machinery		5	2	3
	PC17. Ensure working and performance of required machines and tools.		5	1	4
	PC18. Keep the tools assessable to repair in case of faults/ breakdown		2	0.5	1.5
	Total		100	35	65
3. FIC/Q0122: Produce fruit pulp from various fruits	PC1. Receive fruits from the supplier/vendor and check weight	100	1	0.5	0.5
	PC2. Check quality through physical parameters such as appearance, color, texture, maturity		1	0.5	0.5
	PC3. Load fruits in fruit ripening chamber, adjust controls to set required temperature, time, relative humidity to pre-cool the fruit, monitor temperature to ensure the fruit is cooled to required temperature		3	1	2
	PC4. Open and control the regulator of the ethylene generator or use PLC to introduce ethylene into the chamber to initiate ripening of fruit, monitor air circulation system for uniform ethylene flow for specified period, adjust controlling system to maintain required temperature, relative humidity, etc. for specified period, adjust ventilation system at periodic interval by controlling the speed of exhaust fan to remove carbon-di-oxide		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC5. Open ripening chamber after specified period, start fan to ventilate ethylene gas, stop fan after ventilation, unload the ripened fruit from the ripening chamber, check the quality of ripened fruit and transfer to processing area		2	0.5	1.5
	PC6. Open valves or start pump to fill water in washing tank and control water level, dump fruits into the washing tank for washing		2	0.5	1.5
	PC7. Switch on agitator of revolving screens/blades to immerse each fruit into water to remove dirt, soil, etc		2	0.5	1.5
	PC8. Start the ladder conveyor to lift fruits from the washing tank and transfer to the washing line conveyor		2	0.5	1.5
	PC9. Open valves of the high pressure spraying system for fresh water and adjust pressure to spray water on fruits for rinsing		2	0.5	1.5
	PC10. Adjust controls to transfer washed fruit to sorting/inspecting line, start and adjust speed of sorting/inspecting line conveyor to visually inspect and manually remove damaged, blemished and rotten fruits		2	0.5	1.5
	PC11. Dump sorted fruits in the peeler or corer (depending on the type of fruits), start machine, adjust speed to remove the peel or core of fruits (or) turn valves to introduce steam and adjust controls to maintain pressure for steam peeling		3	1	2
	PC12. Open valve or pump water or open spraying system to wash peeled fruits, observe fruits emerging from peeling/coring machine to ensure removal of peel/core		2	0.5	1.5
	PC13. Cut fruits manually (or) load the fruits in the chopper/cutter/slicer machine, adjust controls to cut fruits to required size, start machine, collect sliced fruits from the discharge chute		2	0.5	1.5
	PC14. In case of mangoes, start conveyor and control speed to allow washed mangoes to pass through mango tip cutting line, cut the mango tip manually, control conveyor speed to dump the tip cut mangoes into		2	0.5	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	destoner machine to remove seed and peel				
	PC15. Control speed of waste disposal conveyor to dispose waste following sop		1	0.5	0.5
	PC16. Adjust and maintain speed of pulper conveyor to allow fruits to pass through the pulper cum finisher/ pulper refiner machine for pulping fruits and sieving pulp to required fineness, adjust position of discharge outlet to collect refined pulp in collection tank, check collected pulp to ensure it is free from seeds and fiber		8	3	5
	PC17. Replace damaged or clogged filter screen of pulper cum finisher/ pulper refiner machine		2	0.5	1.5
	PC18. Start pump to transfer measured quantity of pulp from collection tank to steam jacketed kettle/ pre-cooking tank for cooking pulp, check pumped quantity through the level indicator and glass windows of the pre-cooking tank, adjust controls to set pressure, temperature, cooking time, stirrer speed, etc., open valve to allow steam to pass through kettle for pre-cooking/ pre-heating pulp to required temperature, examine pre-cooked fruits through feel/texture		8	3	5
	PC19. Open valves to allow pre-cooked pulp to pass through de-canter machine to remove black specks, set control of the machine such as speed of screw conveyor in machine and speed/ rotation and start machine to remove black specks (in case of mango)		5	2	3
	PC20. Collect the pre-cooked pulp in the collection tank/ holding tank, sample pulp and transfer to quality lab for analysis and conformance to organisation standards		2	0.5	1.5
	PC21. Set controls of de-aerator machine to remove air from pulp for extended shelf-life, start machine, open valves/start pump to transfer measured quantity of pre-cooked pulp into de-aeration tank to de-aerate pulp		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC22. Set controls of evaporator like flow rate of pulp, temperature, residence time etc to concentrate pulp (for processing concentrated pulp), switch on machine to transfer measured quantity of de-aerated pulp into continuous evaporator for concentrating pulp		5	2	3
	PC23. Open valves/start pump to transfer measured quantity of precooked(or)de-aerated and concentrated pulp into sterilization tank to sterilize pulp before aseptic packing, adjust controls to set temperature, pressure, time, etc. and open valves to allow steam to pass through sterilization tank, switch on machine to start sterilization, observe through glass windows of the sterilization tank, monitor and maintain steam pressure by adjusting gauges to sterilize fruit pulp to organisation standards		4	1	3
	PC24. Set controls to allow the sterilized pulp to pass to the aseptic surge tank for filling, maintain temperature of product surge tank until filling, set controls of the product filler of aseptic filling machine for filling volume, pressure, temperature, etc		4	1	3
	PC25. Place plastic liners in the container (drums, cartons etc), date code aseptic bags with details like date of manufacture, date of expiry etc and place inside the liner for filling pulp, start conveyor and control speed to move the drum with aseptic bags under the aseptic (product) filling machine		2	1	1
	PC26. Fix the spout of the aseptic bag to the filling nozzle of the machine, set controls like pressure, temperature, filling volume etc and start machine to fill hot sterile product and automatically seal/ close with sterile closures		2	0.5	1.5
	PC27. Start conveyor to move the container with filled aseptic bags to the weighing area, check the weight of the container, label the container with details like batch number, date of manufacture, date of expiry, volume/weight etc		2	0.5	1.5
	PC28. Cover the aseptic bags with liner, place lid on drums, close and seal lid,		1	0.5	0.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	transfer to the storage area and store by maintaining storage conditions and following SOP				
	PC29. Operate can reformer, flanger, seamer, can body beader and embossing machines to form cans		1	0.5	0.5
	PC30. Press button to activate machine-lift that raises stacked cans and transfers them onto mechanical conveyor (in mechanical units), observe passing cans and remove defective/ damaged cans from conveyor and discard following SOP		1	0.5	0.5
	PC31. Start machine that automatically feeds empty cans onto conveyors leading to washing, filling and sealing machines (or) set controls like temperature, pressure, conveyor speed of empty can machine, place empty cans in the conveyor and start machine to sterilize cans, collect sterilized cans from other end of the conveyor and transfer to the filling machine		1	0.5	0.5
	PC32. Start conveyor to allow sterilized cans to pass through the filling line (or) place sterilized cans manually in the filling line conveyor		1	0.5	0.5
	PC33. Start pump to fill pre-cooked/preheated pulp into the filling tank, set temperature, volume etc and start machine to fill pulp in cans, control speed of conveyor to transfer filled cans to the can seaming machine (or) manually place lid over the filled cans and seal in cans in can seamer machine		2	0.5	1.5
	PC34. Load the canned product manually in metal baskets, start motor to lower the basket with cans in lager tank with hot water, allow steam to pass through tank to heat continuously to sterilize can to specified temperature and time, mechanically lift basket with sterilised cans from hot water tank and place in cold water tank, open valves to circulate cold water in tanks to cool cans, dry cans manually		2	1	1

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC35. Load the canned product into the retort manually or mechanically through push trucks, close retort door or lid, and turn wheels or moves levers to seal chamber, adjust controls to set pressure, temperature and time of the retort chamber to sterilize canned product following sop		2	0.5	1.5
	PC36. Set process parameters like pressure, temperature, sterilization time etc in the retort following SOP, turns valves to admit steam to retort, observe dials and gauges and adjust controls to maintain process parameters, turn valves to release steam and allow cool water into chamber to prevent overcooking		1	0.5	0.5
	PC37. Open retort and move the canned product to the cooling line conveyor, open valves of the water spraying system and adjust pressure to spray cold water on cans passing though cooling line conveyor, transfer cooled cans to drying line conveyor and start conveyor, set and control temperature and air flow to dry adhering water from the cooled cans		2	1	1
	PC38. Load labels in the packaging machine and set date coding machine for batch number, date of manufacture, date of expiry etc, start labeling machine and date coding machine to label and date code cans, sample canned product and transfer to quality lab for analysis, pack labeled cans into cartons and transfer to storage area and store maintaining storage conditions following SOP		1	0.5	0.5
	PC39. Report discrepancies/concerns to department supervisor for immediate action		1	0.5	0.5
	PC40. Clean the work area, machineries, equipment and tools using recommended cleaning agents and sanitizers		2	0.5	1.5
	PC4. Attend minor repairs/faults of all machines (if any)		1	0.5	0.5
	PC42. Ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines		1	0.5	0.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	and equipment following the SOP or following suppliers instructions/manuals				
	Total		100	35	65
4. FIC/Q0123: Complete documentation and record keeping related to production of fruit pulp	PC1. Document and maintain records of details of raw materials and packaging materials as per organizational standards	100	10	6	4
	PC2. Document and maintain record on observations (if any) related to raw materials and packaging materials		5	3	2
	PC3. Load the raw material details in ERP for future reference		5	3	2
	PC4. Verify the documents and track from finished products to raw materials, in case of quality concerns and during quality management system audits		5	3	2
	PC5. Document and maintain records of production plan with details		10	6	4
	PC6. Document and maintain records of process details for entire production in process chart or production log for all products produced		15	9	6
	PC7. Document and maintain records of batch size, production yield, wastage of raw materials, energy utilization and final product produced		10	6	4
	PC8. Document and maintain record of observations or deviations		5	3	2
	PC9. Load the production plan and process details in ERP for future reference		5	3	2
	PC10. Verify documents and track from finished product to ingredients, in case of quality concerns and for quality management system audit		5	3	2
	PC11. Document and maintain records of finished products		3	2	1
	PC12. Document and maintain records of the finished product details as per organizational standards		7	4	3
	PC13. Document and maintain record on observations or deviations related to finished products		5	3	2
	PC14. Load the finished product details in ERP for future reference		5	3	2
	PC15. Verify the documents and track from finished product to ingredients, in case of quality concerns and for quality management system audits		5	3	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	Total		100	60	40
5. FIC/N9001: Food Safety, hygiene and sanitation for processing food products	PC1. Comply with food safety and hygiene procedures followed in the organization	100	5	2	3
	PC2. Ensure personal hygiene by use of gloves, masks ,hair net, ear plugs, boots etc.		6	1	5
	PC3. Ensure hygienic production of food by inspecting raw materials, ingredients, finished products etc for compliance to physical, chemical and microbiological procedures		5	2	3
	PC4. Pack products in appropriate packaging material, label and store them in designated area free from pests, flies etc.		10	4	6
	PC5. Clean, maintain and monitor food processing equipments periodically, using it only for the specified purpose		5	2	3
	PC6. Use safety equipment such as fire extinguisher, eye wash unit, first aid kit when required		10	4	6
	PC7. Follow housekeeping practices by having designated area for machines/tools		5	2	3
	PC8. Follow industry standards like GMP, HACCP and product recall		10	4	6
	PC9. Attend training on hazard management to understand type of physical, chemical and microbiological hazards		5	1	4
	PC10. Identify, document and report problems such as rodents and pests to management		5	1	4
	PC11. Conduct workplace checklist audit before and after work to ensure safety and hygiene		5	1	4
	PC12. Document and maintain raw material, process, packaging material to maintain the effectiveness of quality system		4	1	3
	PC13. Determine the quality of food using criteria such as odor, color, taste and best before date and take immediate measures to prevent spoilage		5	2	3
	PC14. Store raw materials, finished products and allergens separately to prevent cross contamination		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC15. Label raw materials and finished products and store them in different storage areas according to safe food practices		5	2	3
	PC16. Follow stock rotation based on FEFO/FIFO		10	4	6
	Total		100	35	65
	Grand Total	500	500	300	200
	Percentage Weightage		100	60%	40%
	Minimum Pass% to qualify (aggregate):			70%	

B.Voc (Food Processing and Engineering) Syllabus**1st -B.Voc****NSQF Level: 5 – Semester II****Sub Sector: Fruits & Vegetables****Job Role: Supervisor -Fruit & vegetable processing****UNIT I****Introduction to Food Engineering-PART II**

S.No.	THEORY	Hrs
1.	Boiler: Properties of steam; Steam tables; Boilers mountings and accessories; Boiler rating and steam calculation, Steam distribution, Fittings and insulation.	4
2.	Basics of electrical: Voltage, current and resistance; AC single phase, three phase systems, concepts of phase difference, starters and types of starters, power factor; KW and KVA.	4
3.	Refrigeration and Air-conditioning: Refrigeration and Basic Concepts; Basics of vapour compression cycles; Applications of Refrigeration in Fruit and Vegetable Processing Thermodynamics; Humidity and other Related Terms, definitions, units. Psychrometrics applied to air conditioning and drying	6
TOTAL		14
PRACTICALS		
1.	Operation of Boiler and maintenance	10
2.	Electrical Laboratory, Instrumental Laboratory, Refrigeration unit, Boiler house and workshop	10
3.	Working principle and operation of cold storage	8
TOTAL		28

UNIT II**Fruit Pulp Processing – PART I**

S.No.	THEORY	Hrs
1.	Equipments & tools for pulp extraction: Washing equipment, sorting equipment, Roller type Press, Crusher, Pulping equipment, Straining & screening, filtration equipment, deareator & flash Pasteurizer	2
2.	Pre-processing operations: Quality requirements of raw materials for processing; sourcing and receiving at processing plants; primary processing: grading, sorting, cleaning, washing	2
3.	Canning operation for fruit pulp: canning, process flow diagram for canning, pretreatments before canning operations, pulping (hot & cold) cooking/pasteurization of fruit pulp, processing operations (exhausting and sealing), retorting, ultra high temperature processes, canning process time calculation, sterilizer and accessories used in canning industries, thermal process time calculations for canned foods, standard operating procedures followed in canning industry, CIP and COP for canning machineries: sanitizers and disinfectors used for cleaning processes, stacking and storing of cans, packaging operation followed for cans, GMP and GHP followed during canning of fruit pulp	5
4.	Aseptic processing operation for fruit pulp: contamination control, microbial environmental monitoring, microbiological testing of water, microbiological air testing, characterization of aseptic process, media and incubation condition, theoretical evaluation of aseptic operations, standard operating procedures followed for aseptic process, introduction to CIP and COP for aseptic	4

	machineries: sanitizers and disinfectors used for cleaning processes, stacking and storing of processed product, packaging operation followed for processed product, GMP and GHP followed in aseptic processing industry	
5.	Other preservation techniques of fruit pulp	1
TOTAL		14
PRACTICALS		
1.	Determination of fruit concentration	2
2.	Determination of moisture content	2
3.	Determination of titrable acidity	2
4.	Processing of fruit to pulp (Canning, Chemical, Freezing and Bottling)	2
5.	Physical examination of cans, bottles	2
6.	Determination of vacuum	2
7.	Determination of drained weight	2
8.	Determination of metallic contaminants	2
9.	Determination of pesticide residues	2
10.	Microbial examination	2
11.	Visit to fruit pulp processing industry	8
TOTAL		28

UNIT III		
Food safety, Hygiene, Sanitation in Food Processing Industry		
S.No.	THEORY	Hrs
1.	Critical control points of fruit pulp processing	2
2.	Sorting and first wash inspection of pulping fruits	2
3.	Approved sanitizers in fruit washing	2
4.	Mechanical operations, storage, transportation and distribution, plant design and safety location of processing plant, design of processing plant	4
5.	Effectiveness of sanitation programmes, sanitation rules and regulations, regulatory consideration for sanitizer use, cleaning and sanitation of processing plant (chlorine, chlorine-di-oxide, quaternary ammonium compounds)	4
TOTAL		14
PRACTICALS		
1.	Standard operating procedures (SOP) in fruit pulp industry (cleaning, water quality, storage and so on)	5
2.	Familiarisation with different cleaning tools, sanitizers and equipments	5
3.	Preparation of cleaning or sanitizing solutions	5
4.	Demonstration of methods of sanitation of work place, equipments	5
5.	Visit to food industry to learn food safety, hygiene and sanitation procedures followed	8
TOTAL		28

UNIT IV		
Documentation and Record Keeping in Fruit Pulp Processing Industry		
S.No.	Theory	Credit Hrs
1.	Documentation and Record Keeping: Book-keeping - as fundamental rules of Double entry book keeping, ledger posting, trial balance, profit and loss account and balance Sheet, concept of gross profit, operating profit and Net profit – assets and Liabilities Analysis and interpretation	6

	of financial statements, measurements of performance Cost accounting as a science of cost ascertainment, importance and types of Costing-job costing, process costing, operation costing, Departmental costing Budget-Budgeting and budgetary control-kinds of Budgets-preparation of Budget and various analysis.	
2.	Methodology of food costing – Basic policy decisions- operational control Managing Production through basic operation activities like: Purchasing: essentials of purchasing – qualified purchaser, standard yield, yield testing, standard purchase specification, effective purchasing methods. Types of discounts. Purchasing procedure, effective control tools-levels of stock, purchase requisition, Purchase order, centralized purchasing, and decentralized purchasing. Receiving and Storing: tools of storeroom management, Goods receiving procedure, bin-card, stock book inventory control, FIFO, LIFO Issuing: stores requisition, Production: standardization, standardized recipe, recipe format, scaling up standardized recipe, Service: portion control Elements of cost: Material cost, labour cost and overhead relating costs and profit to volume of sales Cost dynamics and cost behaviour-fixed and variable cost-breakeven analysis Cost reduction techniques – substitution, scientific menu planning, marginal Costing, use of left over and recycling, centralized, buying, scheduling and Staggering of labour and cost benefit analysis.	6
3.	Introduction to ERP	2
TOTAL		14
PRACTICALS		
1.	Preparation of ledgers, manual and digital files	3
2.	Preparation of process manual for processing of fruit pulp	3
3.	Preparation of process manual cleaning and sanitization	3
4.	Preparation of process manual for sorting grading and ripening	3
5.	Preparation of process manual for washing	3
6.	Documentation and inventory management of raw materials and other ingredients	5
7.	Documentation of finished product	4
8.	Documentation of finished product quality	4
TOTAL		28

UNIT V		
Food Quality Analysis		
S.No.	THEORY	Hrs
1.	Food quality testing and evaluation : Concept of food quality and its monitoring, The principles of quality assurance for the agro-industries, Establishment of decision-making processes using official, (government and industry) instrumental, chemical, and sensory procedures, the use of statistical tools in quality assurance and their applications; Food specifications, grades, and standards; Sensory test methods and procedures used to evaluate the flavor, color and texture of foods.	6
2.	Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation; Sensory <i>vis-à-vis</i> instrumental methods for testing quality.	6
3.	Texture analysis of foods, Colour measurements in raw and processed foods, Viscosity measurements and its significance in food quality, Water activity measurements and its significance in food quality, Introduction to chromatographic	2

	methods in food analysis and separation,	
TOTAL		14
PRACTICALS		
1.	Testing and evaluation of quality attributes of raw and processed foods	2
2.	Physico chemical properties of fruits	2
3.	Estimation of moisture content of fruits	2
4.	Determination of soluble and insoluble solids	2
5.	Determination pH	2
6.	Determination of titrable acidity	2
7.	Determination of total sugars and reducing sugars	2
8.	Determination of textural properties	2
9.	Determination of colour	2
10.	Determination of viscosity/consistency	2
11.	Sensory evaluation of food	2
12.	Mini-project on preparation of a model laboratory manual	6
TOTAL		28
Hands on training		
1.	Hands on training in fruit pulp industry	60
TOTAL		270

Model Curriculum

Food Regulatory Affairs Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN MILLING (INCLUDING OILSEEDS), DAIRY PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD, BREAD & BAKERY, ALCOHOLIC BEVERAGES, AERATED WATER/ SOFT DRINKS, SOYA FOOD, PACKAGED FOOD

OCCUPATION: QUALITY ASSURANCE

REF ID: FIC/Q9002, V1.0

NSQF LEVEL: 6

 <p>Skill India शिक्षण - गौरव - रोजगार</p>	 <p>FICSI Food Industry Capacity and Skill Initiative</p>	 <p>N-S-D-C National Skill Development Corporation Transforming the skill landscape</p>
<h2>Certificate</h2>		
<h3>CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS</h3>		
is hereby issued by the		
FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)		
for the		
MODEL CURRICULUM		
Complying to National Occupational Standards of Job Role/Qualification Pack: 'Food Regulatory Affairs Manager' QP No: 'FIC/Q0003, Version 1.0, NSQF Level 6'		
Date of Issuance:	February 1, 2016	 Authorised Signatory (Food Industry Capacity and Skill Initiative)
Valid up to:	March 30, 2019	
* Valid up to the next review date of the Qualification Pack		

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Food Regulatory Affairs Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Food Regulatory Affairs Manager”, in the “Food Processing” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Food Regulatory Affairs Manager		
Qualification Pack Name & Reference ID. ID	FIC/Q9002, v1.0		
Version No.	1.0	Version Update Date	23/02/2016
Pre-requisites to Training	Master’s degree in food science with 8-10 years’ experience in food processing unit or food regulatory matters		
Training Outcomes	After completing this programme, participants will be able to: Designing, developing, implementing and changing food regulatory systems in the organisation. Act as a liaison between organisation and government regulatory agencies Ensure that the products produced and distributed comply with regulatory standards.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of “Food Regulatory Affairs Manager” Qualification Pack issued by “Food Industry Capacity and Skill Initiative”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction to the training program Theory Duration (hh:mm) 01:30 Practical Duration (hh:mm) 00:00 Corresponding NOS Code Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	Overview of the “Food Regulatory Affairs Manager” Role Theory Duration (hh:mm) 01:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	Understanding the roles and responsibilities of food regulatory affairs manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	Introduction to the Food Processing Industry Theory Duration (hh:mm) 01:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	Define food processing List the various sub-sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector, Trainer’s guide, Student manual
4	Introduction to the food regulations and affairs Theory Duration (hh:mm) 05:00 Practical Duration	List the terminology used in the food regulation process State various methods to ensure food regulation State the processes to oversee for ensuring that the food regulations are in compliance	Laptop, white/black board, marker, chart papers, projector, trainer’s guide, student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	(hh:mm) 30:00 Corresponding NOS Code	Understand what are regulatory policies of an organization and follow them	
5	Design, develop and implement regulatory system Theory Duration (hh:mm) 13:00 Practical Duration (hh:mm) 21:00 Corresponding NOS Code FIC/N9011	Understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety Design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency Design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively Design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers) Design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers Set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages Design food regulatory system involving GMP, GHP, and monitoring systems like HACCP Design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>produced, processed, marketed, distributed and sold</p> <p>Design and develop regulatory system ensuring food and health standards are followed in each stage of production and produce food products that meet national and international regulatory standards and protect the health of consumers</p> <p>Design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices</p> <p>Provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product</p> <p>Interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like FSSAI, FDA, EU food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation</p> <p>Develop and review standard operating procedures (SOPs) and ensure that they are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts</p> <p>Develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory</p> <p>Evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes</p> <p>Evaluate promotional and materials for regulatory impact and provide approval</p> <p>Provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance</p>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>Initiate and contribute to process improvements which have an impact on regulatory affairs, quality assurance and other departments</p> <p>Conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation</p> <p>Conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards</p> <p>Review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future</p> <p>Identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant information's and documents transmitting evidence to produce in court to assist prosecution</p> <p>Monitor company progress toward fulfillment of regulatory commitments</p> <p>Provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers</p> <p>Provide training to all department managers on the importance of food regulatory standards and need for its compliance, statutory and regulatory requirements for the products produced, labels of packed products and promotional materials, and the consequences for not following the regulatory requirements</p> <p>Provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court</p>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>and handling them with technical and scientific approach</p> <p>Provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities</p> <p>Provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them</p>	
6	<p>Manage change in food regulatory system</p> <p>Theory Duration (hh:mm) 14:00</p> <p>Practical Duration (hh:mm) 20:00</p> <p>Corresponding NOS Code FIC/N9012</p>	<ul style="list-style-type: none"> • Identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system • Assess gaps in the current policies and procedures and analyze the future requirements • Identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers • Assess risks and benefits associated with the strategies and plans, and develop contingency arrangements design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system • Ensure plan for change in regulatory system include short-term as well as longer-term deliverables • Develop system for monitoring and assessing regulatory system to assess progress in changes implemented • Develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback • Provide training and support to implement changes planned in regulatory system • Communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through 	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, regulatory policies

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>implementing and following the change, to management and concerned employees</p> <ul style="list-style-type: none"> • Make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality • Make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation • Implement the strategies and plans for change in regulatory system with available resources • Make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change • Set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process • Communicate progress achieved through change in regulatory system to everyone involved, and make them understand and enjoy achievement • Review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation • Organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system • Monitor changes implemented in regulatory system , document and communicate the outcome of implemented change to the management • Recognize and reward employees and teams for implementing regulatory system and achieving results through new policies and procedures 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Monitor and ensure changes implemented in regulatory system are effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies 	
7	<p>Prepare representations to regulatory authorities and for new product registrations</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 14:00</p> <p>Corresponding NOS Code FIC/N9013</p>	<p>Prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects</p> <p>Review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments</p> <p>Prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation</p> <p>Coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals</p> <p>Prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity</p> <p>Interface with consultants, research organizations, partners, co-manufacturers etc. for preparation, review, compilation, finalization and submission of documents for regulatory approvals</p> <p>Prepare responses to communications and other requests from government food regulatory authorities</p> <p>Prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance</p> <p>Identify reasons related to non-compliance of food products to regulatory standards, collect relevant information's and data,</p>	<p>Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, audit documents, regulatory policies</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban</p> <p>Interact with various regulatory authorities during concept, development and industrialization stages of projects for clarification and approvals</p> <p>Interact with the notified bodies and competent authorities for developing and reviewing regulatory standards</p> <p>Coordinate with regulatory authorities for reporting, to comment on proposed regulations, and to represent company's interest in the development of standards and guidelines</p> <p>Discuss on the differences that exist in the regulations laid down by different governments and their interpretation by the regulatory agencies and ensure that efficient and economical regulatory standards are planned</p> <p>Identify possible threats or opportunities from upcoming regulations under FSSAI, consumer affairs, other government food policies and regulations and liaise with industry associations to tackle/manage them effectively</p> <p>Participate in seminar, workshops, conferences and meetings organised by FSSAI and other industry association, representing the organisation to maintain, strengthen and expand contacts</p> <p>Work closely with regulatory and trade associations like CII (confederation of indian industries), FICCI (federation of indian chambers of commerce and industries), CIFTI (confederation of indian food trade and industry), AIFPA (all india food processors association), ASSOCHAM(the associated chambers of commerce of india) etc on national and international regulatory changes and challenges that have impact on food products produced in the</p>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>organisation and to manage them proactively</p> <p>Develop and write clear arguments and explanations for new product license</p> <p>Prepare and present registration documents to regulatory authorities and notified bodies for new product approvals</p> <p>Present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing</p> <p>Evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome</p> <p>Prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval</p> <p>Provide regulatory and product compliance report in the area of advertising and label claims for new products</p>	
8	<p>Field Visits</p> <p>Theory Duration (hh:mm) 04:00</p> <p>Practical Duration (hh:mm) 20:00</p> <p>Corresponding NOS Code</p>	<p>Observe the location, layout and safety aspects of food processing</p> <p>Observe the storage facilities for raw materials and finished products</p> <p>Observe the various machineries used in process</p> <p>Observe the various machineries used in process</p> <p>Observe the cleaning methods and processes followed to maintain the process machineries and tools</p> <p>Observe the raw materials used and their storage procedures</p> <p>Observe the packaging and storage processes of raw material and finished product</p> <p>Observe the post-production cleaning and maintenance process followed in the industry</p>	All the tools and equipment listed above must be available at the site of field visit
9	<p>Revision</p> <p>Theory Duration (hh:mm) 01:00</p>	Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 01:00 Corresponding NOS Code		
10	Evaluation Theory Duration (hh:mm) 06:00 Practical Duration (hh:mm) 28:00 Corresponding NOS Code	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above must be available for evaluation
11	On-the-job Training Theory Duration (hh:mm) 08:00 Practical Duration (hh:mm) 24:00 Corresponding NOS Code	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration 240:00 Theory Duration 79:00 Practical Duration 161:00	Unique Equipment Required: Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, audit documents, regulatory policies	

Grand Total Course Duration: **240 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [SSC: Food Industry Capacity and Skill Initiative](#))

Trainer Prerequisites for Job role: “Food Regulatory Affairs Manager” mapped to Qualification Pack: “FIC/Q9002, v1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “FIC/Q9002”, Version 1.0
2	Personal Attributes	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	Minimum Educational Qualifications	B.Sc/B.Tech/BE in Food Process Engineering/ Food Safety and Quality Management in Food Process Engineering with 5-6 years of hand on experience in QA/regulations of a food Processing Industry or M.Sc/M.Tech/ME or in Food Process Engineering/ Food Safety and Quality Management in Food Safety/Food Process Engineering with 3-4- years of hand on experience in QA/regulations of a food Processing Industry
4a	Domain Certification	Certified for Job Role: “ <u>Food regulatory affairs Manager</u> ” mapped to QP: “ <u>FIC/Q9002, v1.0</u> ”. Minimum accepted score is 80%
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/Q1402”. Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	Experience	B.Sc/B.Tech/BE in Food Process Engineering/ Food Safety and Quality Management in Food Process Engineering with 5-6 years of hand on experience in QA/regulations of a food Processing Industry or M.Sc/M.Tech/ME or in Food Process Engineering/ Food Safety and Quality Management in Food Safety/Food Process Engineering with 3-4- years of hand on experience in QA/regulations of a food Processing Industry

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Food regulatory affairs manager
Qualification Pack	FIC/Q9002 v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9011: Design, develop and implement regulatory system	PC.1 understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety	100	4	1.5	2.5
	PC2. design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency		4	1.5	2.5
	PC3. design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively		4	1.5	2.5
	PC4. design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers		4	1.5	2.5
	PC5. design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers		4	1.5	2.5
	PC6. set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages		4	1.5	2.5
	PC7. design food regulatory system involving gmp, ghp, and monitoring systems like haccp		4	1.5	2.5
	PC8. design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products produced, processed, marketed, distributed and sold		4	1.5	2.5
	PC9. design and develop regulatory system ensuring food and health standards are followed in each stage of production and		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	produce food products that meet national and international regulatory standards and protect the health of consumers				
	PC10. design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices		4	1.5	2.5
	PC11. provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product		4	1.5	2.5
	PC12. interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like fssai, fda, eu food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation		4	1.5	2.5
	PC13. develop and review standard operating procedures (sops) and ensure sops are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts		4	1.5	2.5
	PC14. develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory		4	1.5	2.5
	PC15. evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes		4	1	3
	PC16. evaluate promotional and materials for regulatory impact and provide approval		4	1	3
	PC17. provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance		3	1	2
	PC18. initiate and contribute to process improvements which have an impact on		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	regulatory affairs, quality assurance and other departments				
	PC19. conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation		3	1	2
	PC20. conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards		3	1	2
	PC21. review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future		3	1	2
	PC22. identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant information's and documents transmitting evidence to produce in court to assist prosecution		3	1	2
	PC23. monitor company progress toward fulfillment of regulatory commitments		3	1	2
	PC24. provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers		3	1	2
	PC25. provide training to all department managers on the importance of food regulatory standards and need for its compliance, statutory and regulatory requirements for the products produced, labels of packed products and promotional materials, and the consequences for not following the regulatory requirements		3	1	2
	PC26. provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court and handling them with technical and scientific approach		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC27. provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities		3	1	2
	PC28. provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them		3	1	2
			100	35	65
2. FIC/N9012: Manage change in food regulatory system	PC1. identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system	100	5	1	4
	PC2. assess gaps in the current policies and procedures and analyze the future requirements		5	1	4
	PC3. identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers		5	1	4
	PC4. assess risks and benefits associated with the strategies and plans, and develop contingency arrangements		5	1	4
	PC5. design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system		5	1	4
	PC6. ensure plan for change in regulatory system include shortterm as well as longer-term deliverables.		4	1.5	2.5
	PC7. develop system for monitoring and assessing regulatory system to assess progress in changes implemented		5	2	3
	PC8. develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback		5	2	3
	PC9. provide training and support to implement changes planned in regulatory system		4	2	2
	PC10. communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through implementing and		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	following the change, to management and concerned employees				
	PC11. make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality		4	1.5	2.5
	PC12. make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation		5	2	3
	PC13. implement the strategies and plans for change in regulatory system with available resources		5	2	3
	PC14. make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change		5	2	3
	PC15. set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process		5	2	3
	PC16. communicate progress achieved through change in regulatory system to everyone involved, and make them understand and enjoy achievement		4	1.5	2.5
	PC17. review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation		5	2	3
	PC18. organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system		5	2	3
	PC19. monitor changes implemented in regulatory system, document and communicate the outcome of implemented change to the management		5	2	3
	PC20. recognize and reward employees and teams for implementing regulatory system and achieving results through new policies and procedures		4	1.5	2.5
	PC21. monitor and ensure changes implemented in regulatory system are		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies				
			100	35	65
3. FIC/N9013: Prepare representations to regulatory authorities and for new product registrations	PC1. prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects	100	5	1	4
	PC2. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments		5	1	4
	PC3. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation		5	1	4
	PC4. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals		5	1	4
	PC5. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity		4	1.5	2.5
	PC6. interface with consultants, research organizations, partners, co-manufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals		4	1.5	2.5
	PC7. prepare responses to communications and other requests from government food regulatory authorities		4	1.5	2.5
	PC8. prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC9. Identify reasons related to noncompliance of food products to regulatory standards, collect relevant information's and data, prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban		4	1.5	2.5
	PC10. prepare simple and complex regulatory documents in accordance with applicable fssai regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects		5	2	3
	PC11. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments		5	2	3
	PC12. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation		5	2	3
	PC13. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals		5	2	3
	PC14. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity		4	1.5	2.5
	PC15. interface with consultants, research organizations, partners, co-manufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals		4	1.5	2.5
	PC16. prepare responses to communications and other requests from government food regulatory authorities		5	2	3
	PC17. develop and write clear arguments and explanations for new product license		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC18. prepare and present registration documents to regulatory authorities and notified bodies for new product approvals		5	2	3
	PC19. present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing		5	2	3
	PC20. evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome		4	1.5	2.5
	PC21. prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval		4	1.5	2.5
	PC22. Provide regulatory and product compliance report in the area of advertising and label claims for new products		4	1.5	2.5
	Total		100	35	65
	Grand Total	300	300	200	100
	Percentage Weightage		100	60%	40%
	Minimum Pass% to qualify (aggregate):			70%	



Model Curriculum

Production Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN
OCCUPATION: MILLING (INCLUDING OILSEEDS), DAIRY
PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD,
BREAD & BAKERY, ALCOHOLIC BEVERAGES,
AERATED WATER/ SOFT DRINKS, SOYA FOOD,

PACKAGED FOOD
PROCESSING

REF ID: FIC/Q9003, V1.0
NSQF LEVEL: 7



Certificate

**CURRICULUM COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS**

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/Qualification Pack: **'Production Manager'**
QP No. **'FIC/Q9903, Version 1.0, NSQF Level 7'**

Date of Issuance: **March 30, 2016**

Valid up to: **March 30, 2019**

* Valid up to the next review date of the Qualification Pack

Madhika Verma

Authorised Signatory
(Food Industry Capacity and Skill Initiative)



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Production Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Production Manager”, in the “Food Processing” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Production Manager		
Qualification Pack Name & Reference ID. ID	FIC/Q9003, v1.0		
Version No.	1.0	Version Update Date	30/03/2016
Pre-requisites to Training	Preferably Class 12 and 2-3 years' experience in a food processing unit		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> Production of food products through the process of production planning, coordinating and controlling production process to achieve quantity and quality product Reviewing production process to minimize production cost and optimizing production. 		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of “Production Manager” Qualification Pack issued by “Food Industry Capacity and Skill Initiative”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction to the training program Theory Duration (hh:mm) 00:30 Practical Duration (hh:mm) 00:00 Corresponding NOS Code Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	Overview of the “Production Manager” Role Theory Duration (hh:mm) 01:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	Understanding the roles and responsibilities of production manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	Introduction to the Food Processing Industry Theory Duration (hh:mm) 01:30 Practical Duration (hh:mm) 00:00 Corresponding NOS Code	Define food processing List the various sub sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
4	Introduction to food processing process Theory Duration (hh:mm) 02:00 Practical Duration (hh:mm)	List the common machineries used in food processing Explain the process of testing food for accepted quality standards Demonstrate the test for checking the quality of food Describe the procedure for processing various food	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	04:00 Corresponding NOS Code	Identify different equipment used in food industry	
5	Organizational standards and norms Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 02:00 Corresponding NOS Code	State the roles and responsibilities of a production manager State how to conduct yourself at the workplace State the personal hygiene and sanitation guidelines State the food safety hygiene standards to follow in a work environment	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
6	Manage production process in food processing unit Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm) 11:40 Corresponding NOS Code FIC/N9014	<ul style="list-style-type: none"> Communicate the organisation policies and goals clearly to the employees of production team, make them understand and commit their energy and expertise to achieve organisation goals Achieve department targets and organisation goals by understanding the organisation and employees, developing a leadership style and applying them appropriately Communicate with employees regularly and effectively, help them identify their strengths, provide support to overcome their weakness, listen to their grievances and provide appropriate solutions, and win their trust and support Motivate and support employees to achieve their work and development objectives, and provide recognition when they are successful Encourage employees to take responsibilities, to take own decisions within agreed boundaries, to take lead in their own areas of expertise for their development Initiate personnel actions, such as promotions, transfers, discharges or disciplinary measures Lead production department and team successfully through difficulties and challenges Review the sales forecast for the week/month (or) monthly production 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>plan discussed with plant manager (or) customer requirement (as applicable) and identify production priorities to meet market requirement</p> <ul style="list-style-type: none"> • Identify and confirm resource availability such as raw materials, packing materials, equipment availability and capacity, production capacity, manpower requirement and availability, stock level, storage capacity, transport capacity etc • Plan details of production in terms of output quantity and quality, cost, time and manpower requirements • Analyze the consequences of failing to meet production/delivery timelines to meet the schedule, notify relevant authorities of any possibility that demand cannot be met within required timeframe • Develop production schedule to meet market demands/priorities and delivery timelines within budget and with available resources, consult production plan with inter department heads and production supervisor, instruct supervisor to allocate work to production team • Communicate the production schedule to cross function heads through communication system followed by the organisation such as e-mail or upload in the ERP system • Identify and confirm equipment requirements to meet production target, share production schedule with equipment requirement to maintenance manager/supervisor for maintenance plan that aligns with production plan • Co-ordinate with maintenance manager/supervisor to understand materials, consumables and manpower requirement and availability for maintenance activities, for uninterrupted production • Understand equipment maintenance process and procedure and co-ordinate for maintenance activities during breakdown, emergency response, routine cleaning and servicing, etc. • Analyze equipment maintenance data to interpret equipment 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>performance and arrive at production capability of each process equipment</p> <ul style="list-style-type: none"> • Co-ordinate with maintenance team to ensure reliable equipment performance with minimal disruption to production, to minimize down time during equipment breakdowns, and to optimize equipment efficiency to achieve production target • Lead and build team spirit between production and maintenance personnel through effective communication to enhance equipment performance and to identify production improvement opportunities • Ensure maintenance procedures are followed meet food safety and environmental requirements • Monitor production process for usage of raw materials, packaging materials, manpower, wastage against production plan and identify reason for variances against plan • Address the reason for variation in achieving production schedule, production target within allocated budget • Adjust production schedule in response to variables affecting achievement of production target • Monitor production output and cost, adjust processes and resources to minimize cost and to achieve quantity and quality product • Reschedule production plan in case of urgent requirement or any unforeseen event, to minimize wastage and to utilize materials/utilities and resources efficiently, discuss and negotiate changes with inter department team on time for their support and team work • Review production schedule and process, consult /discuss with supervisor, team and cross function teams identify opportunities for improvement and develop recommendations for improvement on production process • Set polices, plans and procedures, and take initiative to implement the identified improvement opportunities 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>to control cost and to achieve better yield and quality</p> <ul style="list-style-type: none"> • Monitor, review and ensure production details are documented to meet the documentation requirements of the organisation, and to meet audit requirements like ISO, HACCP, etc • Understand objective of trial production, trial product processing method and specification, select production team for trial, discuss with cross function team like planning, QA, maintenance etc, clarify roles and responsibilities and level of authority to the team and cross function • Prepare technical production procedures considering all engineering and process parameters for new product trial, educate and train supervisors and operators on trial procedure • Identify and consider all possible hazards, prepare plan and procedures to prevent and control hazards, provide training to trial team to handle hazards • Prepare detailed trial production schedule to manage production process without overlapping/affecting with regular production, and considering availability of raw materials and packaging materials, machine availability and capability, man power availability and competency etc • Monitor trial production against plan to identify variances and factors that need to be adjusted to achieve product of required specification within the planned time • Document and evaluate trial production data and identify process/parameters to be modified/changed to achieve product of required specification • Prepare trial production report with recommendations on improvement opportunities, and share with cross function heads and relevant authorities for suggestion and consideration 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
7	<p>Manage production optimization and cost efficiency</p> <p>Theory Duration (hh:mm) 08:00</p> <p>Practical Duration (hh:mm) 12:00</p> <p>Corresponding NOS Code FIC/N9015</p>	<p>Review production reports and analyze equipment performance, process capability, change over time, maintenance, consumables, power etc, to identify factors that affect performance of production and recommend improvement opportunities</p> <p>Compile performance data on process and equipment to identify cause for lack of performance, evaluate opportunities to improve, identify cost saving options, propose changes in process, and implement proposal with proper approvals</p> <p>Review production process with supervisor and machine operators to identify reasons for slowdown or stop of production process, provide recommendations to overcome efficiency issues, take feedback, develop plans for implementing recommended changes, monitor changes implemented, and review changes and improvement</p> <p>Calculate utilities and energy usage in production area and for production process, identify methods to minimize usage</p> <p>Develop plans and procedures to minimize use of utilities and energy without affecting the production efficiency</p> <p>Identify energy and utility losses or sources of waste, analyze reason, recommend methods to improve efficient energy/utility application, ensure recommendations are implemented, and monitor improvement</p> <p>Identify areas where utilities and energy can be saved, and Identify methods to save energy like recycling energy and utilities such as steam, heat and water, following proper maintenance methods to avoid leaks and losses etc, and prepare efficient production schedule such that target is met with efficient utilization of energy and utility</p> <p>Analyze usage pattern of energy and other utilities in production area and process against budget allocation, identify cost effective options for</p>	<p>Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook ,</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>minimizing wastage, and implement changes</p> <p>Identify system, production process that need to be changed, identify opportunities for implementing change in production process, analyze impact of change on product quality, impact on the team and present production process</p> <p>Communicate with relevant authorities/superiors the need for change, results and benefits expected out of change</p> <p>Design new processes, procedures, systems, structures with roles and responsibilities, key performance indicators, training needs, safety system, contingency plans, monitoring and reporting system to implement planned changes in production process</p> <p>Provide training and support to implement changes, develop a strategy to help teams implement change</p> <p>Monitor changes implemented in production process and ensure changes are effective and meet the organisation and regulatory requirements</p> <p>Document and communicate the progress achieved through implemented change to the management and everyone involved, and make them understand and enjoy achievement</p> <p>Recognize and reward employees and teams for implementing change in production system and achieving better efficiency</p> <p>Manage budget efficiently by managing production with available resource, by avoiding overtime and too many casual workers/helpers</p> <p>Plan effectively to secure, confirm and allocate required manpower to meet production target within budget, monitor resource utilization, to achieve production target within existing resource</p> <p>Identify situations where actual budget exceeds the approved budget, investigate reason for variance and take appropriate</p>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>corrective action to keep budget under control</p> <p>Identify the impact on budget of production-related decisions like scheduling holidays, adjusting production volume, scheduling equipment maintenance etc, before scheduling production, and identify opportunities to improve performance against budget</p> <p>Identify the causes for any significant variances in budget control, discuss with team and ensure prompt corrective action is taken to keep expenditure under control</p> <p>Encourage team to think and identify ways of reducing expenditure, analyse and pursue the suggested ideas</p>	
8	<p>Manage documentation system and implement safety and environmental policies</p> <p>Theory Duration (hh:mm) 07:00</p> <p>Practical Duration (hh:mm) 09:00</p> <p>Corresponding NOS Code FIC/N9016</p>	<ul style="list-style-type: none"> Establish to production team the importance of documentation, provide training on documentation system, and ensure all documents are maintained systematically Ensure all relevant records and documents are complete, up-to-date and accessible for audits on production process During audit provide the auditor with access to all relevant information, records and documents Ensure corrective actions recommended and implemented are documented to assure production process is carried in accordance with organisation and regulatory standards Establish methods to track production information from documented and maintained records Establish to production team importance of safety and environment requirements related to food processing unit, communicate information about safety and environmental policies and related procedures to the team Co-ordinate with quality team to prepare policies and sops on safety and environment requirements related to production function, and ensure those procedure are followed in production area and during production process 	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • Ensure safe work procedures are followed in production area and during production process • Ensure policies and standard operating procedures on safety and environment requirements are accessible to all employees of production team, and are followed to meet the regulatory requirements • Identify safety and environmental hazards relevant to production processes, implement system to handle risks • Provide or organize training through relevant authorities on safety and environmental management system, to understand methods to control and prevent hazards • Conduct inspections in work place on use of protective clothing and accessories, and to ensure safety system is followed during production process • Conduct audits and review records on safety and environmental system to monitor if control systems are followed by production team, and address non-compliance following organisation standards • Implement system on waste management in production area and process, monitor and confirm waste collection, treatment, recycling or disposal is carried out meeting industry requirements and environmental regulations • Respond to environmental management hazard identification and incidents in an appropriate and timely way • Review practice and procedures followed on safety, conduct risk assessments, identify non-compliance, and provide recommendations to address gaps and non-conformances • Review environmental records documents maintained, analyze data to evaluate effectiveness of the environmental management system and identify areas for improvement, plan and implement improvements to meet regulatory requirements 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
9	Professional and Core Skills Theory Duration (hh:mm) 03:00 Practical Duration (hh:mm) 05:00 Corresponding NOS Code	Undertake a self-assessment test Identify personal strengths and weaknesses Plan and schedule the work order and manage time effectively to complete the tasks assigned Prevent potential problems from occurring Resolve issues and problems using acquired knowledge and realize the importance of decision making Identify potential problems and make sound and timely decision Improve your reading skills State the importance of listening	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
10	IT Skills Theory Duration (hh:mm) 05:00 Practical Duration (hh:mm) 07:00 Corresponding NOS Code	Identify parts of the computer Use the computer keyboard effectively to type Use computer applications effectively to record day-to-day activities Use the word processor effectively Use the spreadsheet application effectively Use the computer to document day-to-day activities	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
11	Field Visits Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 30:00 Corresponding NOS Code	Observe the factory location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in process Observe the various machineries used in process Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
12	Revision Theory Duration (hh:mm) 02:00	Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 02:00 Corresponding NOS Code		
13	Evaluation Theory Duration (hh:mm) 08:00 Practical Duration (hh:mm) 20:00 Corresponding NOS Code	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above must be available for evaluation
14	On-the-job Training Theory Duration (hh:mm) 30:00 Practical Duration (hh:mm) 65:00 Corresponding NOS Code	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration 240:00 Theory Duration 88:00 Practical Duration 152:00	Unique Equipment Required: Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook , cleaning machines, destoner, pulverizer, kneader, mixer, roaster, dryer, oven, extruder, packaging machines flaker, machineries blender, Measurement Cane; Weighing balance, Timer, Gas with Burner; Knives, spatulas, packing wrap rolls, measuring cup and spoons, utensils, ladle, ladle with holes, digital hygrometer, Muslin Cloth; Weighing Machine; Milk Stirrer; Thermometer; Test Tube (Glass); Test Tube Holder; Gas with Burner,	

Grand Total Course Duration: **240Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative**)

Trainer Prerequisites for Job role: “Production Manager” mapped to Qualification Pack: “FIC/Q9003, v1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “FIC/Q9003”, Version 1.0
2	Personal Attributes	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	Minimum Educational Qualifications	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 5-6 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry
4a	Domain Certification	Certified for Job Role: “ <u>Production Manager</u> ” mapped to QP: “ <u>FIC/Q9003, v1.0</u> ”. Minimum accepted score is 80%
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/Q1402”. Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	Experience	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 5-6 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Production Manager
Qualification Pack	FIC/Q9003, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9014: Manage production process in food processing unit	PC1. Communicate clearly the organisation policies and goals to the employees of production team, make them understand and commit their energy and expertise to achieve organisation goals	100	2.5	1	1.5
	PC2. Achieve department targets and organisation goals by understanding the organisation and employees, developing a leadership style and applying them appropriately		2.5	1	1.5
	PC3. Communicate with employees regularly and effectively, help them identify their strengths, provide support to overcome their weakness, listen to their grievances and provide appropriate solutions, and win their support		3	1	2
	PC4. Motivate and support employees to achieve their work and development objectives, and provide recognition when they are successful		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC5. Encourage employees to take responsibilities, to take own decisions within agreed boundaries, to take lead in their own areas of expertise for their development		2.5	1	1.5
	PC6. Initiate personnel actions, such as promotions, transfers, discharges or disciplinary measures		3	1	2
	PC7. Lead production department and team successfully through difficulties and challenges		3	1	2
	PC8. Review the sales forecast for the week/month (or) monthly production plan discussed with plant manager (or) customer requirement (as applicable) and identify production priorities to meet market requirement		3	1	2
	PC9. Identify and confirm resource availability like raw materials, packing materials, equipment availability and capacity, production capacity, manpower requirement and availability, stock level, storage capacity, transport capacity etc		3	1	2
	PC10. Plan details of production in terms of output quantity and quality, cost, time and manpower requirements		3	1	2
	PC11. Analyze the consequences of failing to meet production/delivery timelines to meet the schedule, notifying relevant authorities of any possibility that demand cannot be met within required timeframe		3	1	2
	PC12. Develop production schedule to meet market demands/priorities and delivery timelines within budget and with available resources, consult production plan with inter department heads and production supervisor, instruct supervisor to allocate work to production team		3	1	2
	PC13. Communicate the production schedule to cross function heads through communication system followed by the organisation like e-mail or upload in the erp system		2.5	1	1.5
	PC14. Identify and confirm equipment requirements to meet production target, share production schedule with equipment requirement to maintenance manager/supervisor for		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	maintenance plan that aligns with production plan				
	PC15. Co-ordinate with maintenance manager/supervisor to understand materials, consumables and manpower requirement and availability for maintenance activities, for uninterrupted production		3	1	2
	PC16. Understand equipment maintenance process and procedure and co-ordinate for maintenance activities during breakdown, emergency response, routine cleaning and servicing etc		2.5	1	1.5
	PC17. Analyze equipment maintenance data to interpret equipment performance and arrive at production capability of each process equipment		3	1	2
	PC18. Co-ordinate with maintenance team to ensure reliable equipment performance with minimal disruption to production, to minimize down time during equipment breakdowns, and to optimize equipment efficiency to achieve production target		3	1	2
	PC19. Lead and build team spirit between production and maintenance personnel through effective communication to enhance equipment performance and to identify production improvement opportunities		2.5	1	1.5
	PC20. Ensure maintenance procedures followed meet food safety and environmental requirements		2.5	1	1.5
	PC21. Monitor production process for usage of raw materials, packaging materials, manpower, wastage against production plan and identify reason for variances against plan		3	1	2
	PC22. Address the reason for variation in achieving production schedule, production target within allocated budget		3	1	2
	PC23. Adjust production schedule in response to variables affecting achievement of production target		3	1	2
	PC24. Monitor production output and cost, adjust processes and resources to minimize cost and to achieve quantity and quality product		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC25. Reschedule production plan in case of urgent requirement or any unforeseen event, to minimize wastage and to utilize materials/utilities and resources efficiently, discuss and negotiate changes with inter department team on time for their support and team work		3	1	2
	PC26. Review production schedule and process, consult /discuss with supervisor, team and cross function teams identify opportunities for improvement and develop recommendations for improvement on production process		3	1	2
	PC27. Set polices, plans and procedures, and take initiative to implement the identified improvement opportunities to control cost and to achieve better yield and quality		3	1	2
	PC28. Monitor, review and ensure production details are documented to meet the documentation requirements of the organisation, and to meet audit requirements like iso, haccp etc		3	1	2
	PC29. Understand objective of trial production, trial product processing method and specification, select production team for trial, discuss with cross function team like planning, qa, maintenance etc, clarify roles and responsibilities and level of authority to the team and cross function		3	1	2
	PC30. Prepare technical production procedures considering all engineering and process parameters for new product trial, educate and train supervisors and operators on trial procedure		3	1	2
	PC31. Identify and consider all possible hazards, prepare plan and procedures to prevent and control hazards, provide training to trial team to handle hazards		2.5	1	1.5
	PC32. Prepare detailed trial production schedule to manage production process without overlapping/affecting with regular production, and considering availability of raw materials and packaging materials,		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	machine availability and capability, man power availability and competency etc				
	PC33. Monitor trial production against plan to identify variances and factors that need to be adjusted to achieve product of required specification within the planned time		3	1	2
	PC34. Document and evaluate trial production data and identify process/parameters to be modified/changed to achieve product of required specification		3	1	2
	PC35. Prepare trial production report with recommendations on improvement opportunities, and share with cross function heads and relevant authorities for suggestion and consideration		3	1	2
2. FIC/N9015: Manage production optimization and cost efficiency in food processing unit	PC1. Review production reports and analyze equipment performance, process capability, change over time, maintenance, consumables, power etc, to identify factors that affect performance of production and recommend improvement opportunities	100	2	0.5	1.5
	PC2. Compile performance data on process and equipment to identify cause for lack of performance, evaluate opportunities to improve, identify cost saving options, propose changes in process, and implement proposal with proper approvals		3	0.5	2.5
	PC3. Review production process with supervisor and machine operators to identify reasons for slowdown or stop of production process, provide recommendations to overcome efficiency issues, take feedback, develop plans for implementing recommended changes, monitor changes implemented, and review changes and improvement		3	1	2
	PC4. Calculate utilities and energy usage in production area and for production process, identify methods to minimize usage		2	0.5	1.5
	PC5. Develop plans and procedures to minimize use of utilities and energy		2	0.5	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	without affecting the production efficiency				
	PC6. Identify energy and utility losses or sources of waste, analyze reason, recommend methods to improve efficient energy/utility application, ensure recommendations are implemented, and monitor improvement		2	0.5	1.5
	PC7. Identify areas where utilities and energy can be saved, and identify methods to save energy like recycling energy and utilities such as steam, heat and water, following proper maintenance methods to avoid leaks and losses etc, and prepare efficient production schedule such that target is met with efficient utilization of energy and utility		3	1	2
	PC8. Analyze usage pattern of energy and other utilities in production area and process against budget allocation, identify cost effective options for minimizing wastage, and implement changes		3	1	2
	PC9. Identify system, production process that need to be changed, identify opportunities for implementing change in production process, analyze impact of change on product quality, impact on the team and present production process		3	1	2
	PC10. Communicate with relevant authorities/superiors the need for change, results and benefits expected out of change		1	0.5	0.5
	PC11. Design new processes, procedures, systems, structures with roles and responsibilities, key performance indicators, training needs, safety system, contingency plans, monitoring and reporting system to implement planned changes in production process		1	0.5	0.5
	PC12. Provide training and support to implement changes, develop a strategy to help teams implement change		2	0.5	1.5
	PC13. Monitor changes implemented in production process and ensure		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	changes are effective and meet the organisation and regulatory requirements				
	PC14. Document and communicate the progress achieved through implemented change to the management and everyone involved, and make them understand and enjoy achievement		4	1.5	2.5
	PC15. Recognize and reward employees and teams for implementing change in production system and achieving better efficiency		5	2	3
	PC16. Manage budget efficiently by managing production with available resource, by avoiding overtime and too many casual workers/helpers		4	1.5	2.5
	PC17. Plan effectively to secure, confirm and allocate required manpower to meet production target within budget, monitor resource utilization, to achieve production target within existing resource		4	1.5	2.5
	PC18. Identify situations where actual budget exceeds the approved budget, investigate reason for variance and take appropriate corrective action to keep budget under control		1	0.5	0.5
	PC19. Identify the impact on budget of production-related decisions like scheduling holidays, adjusting production volume, scheduling equipment maintenance etc, before scheduling production, and identify opportunities to improve performance against budget		1	0.5	0.5
	PC20. Identify the causes for any significant variances in budget control, discuss with team and ensure prompt corrective action is taken to keep expenditure under control		3	1	2
	PC21. Encourage team to think and identify ways of reducing expenditure, analyze and pursue the suggested ideas		4	1	3
			100	35	65
3. FIC/N9016: Manage documentation system and implement	PC1. Establish to production team the importance of documentation, provide training on documentation system, and ensure all documents are maintained systematically	100	6	2	4

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
safety and environmental policies in food processing unit	PC2. Ensure all relevant records and documents are complete, up-to-date and accessible for audits on production process		6	2	4
	PC3. During audit provide the auditor with access to all relevant information, records and documents		6	3	3
	PC4. Ensure corrective actions recommended and implemented are documented to assure production process is carried in accordance with organisation and regulatory standards		6	2	4
	PC5. Establish methods to track production information from documented and maintained records		5	2	3
	PC6. Establish to production team importance of safety and environment requirements related to food processing unit, communicate information about safety and environmental policies and related procedures to the team		6	2	4
	PC7. Co-ordinate with quality team to prepare policies and sops on safety and environment requirements related to production function, and ensure those procedure are followed in production area and during production process		6	2	4
	PC8. Ensure safe work procedures are followed in production area and during production process		6	2	4
	PC9. Ensure policies and standard operating procedures on safety and environment requirements are accessible to all employees of production team, and are followed to meet the regulatory requirements		5	2	3
	PC10. Identify safety and environmental hazards relevant to production processes, implement system to handle risks		6	2	4
	PC11. Provide or organize training through relevant authorities on safety and environmental management system, to understand methods to control and prevent hazards		6	2	4
	PC12. Conduct inspections in work place on use of protective clothing and accessories, and to ensure safety		6	2	4

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	system is followed during production process				
	PC13. Conduct audits and review records on safety and environmental system to monitor if control systems are followed by production team, and address non-compliance following organisation standards		6	2	4
	PC14. Implement system on waste management in production area and process, monitor and confirm waste collection, treatment, recycling or disposal is carried out meeting industry requirements and environmental regulations		6	2	4
	PC15. Respond to environmental management hazard identification and incidents in an appropriate and timely way		6	2	4
	PC16. Review practice and procedures followed on safety, conduct risk assessments, identify non-compliance, and provide recommendations to address gaps and non-conformances		6	2	4
	PC17. Review environmental records documents maintained, analyze data to evaluate effectiveness of the environmental management system and identify areas for improvement, plan and implement improvements to meet regulatory requirements		6	2	4
	Total		100	35	65
	Grand Total	400	400	300	100
	Percentage Weightage		100	60%	40%
	Minimum Pass% to qualify (aggregate):			70%	

