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

REVISED SYLLABUS

B. Voc. (Food Processing & Engineering)

2021 - 2022

DEPARTMENT OF FOOD PROCESSING & ENGINEERING

Scheme of Instruction For B. Voc. (Food Processing & Engineering)								
General Education Component (NEP)								
(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)								
Semesters	**Paper No.**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Total Credit**
	FFA010	Communication Language Kannada	03:00:00	45	0	0	45	3
	FFA410	Biochemistry-I	02:00:01	30	0	15	45	3
Sem I	FFA420	Microbiology-I	02:00:01	30	0	15	45	3
	FFA430	Computer Fundamentals & DOS	02:00:01	30	0	15	45	3
								12
	FFB020	Communication Language English	03:00:00	45	0	0	45	3
	FFB410	Biochemistry-II	02:00:01	30	0	15	45	3
Sem II	FFB420	Microbiology-II	02:00:01	30	0	15	45	3
	FFB430	Computer C Programming	02:00:01	30	0	15	45	3
								12
	FFC140	Indian Constitution	03:00:00	45	0	0	45	3
	FFC440	ICT	02:00:01	30	0	15	45	3
Sem III	FFC410	Biochemistry-III	02:00:01	30	0	15	45	3
	FFC420	Microbiology-III	02:00:01	30	0	15	45	3
								12
	FFD450	Bio statistics	02:00:01	30	0	15	45	3
	FFD410	Biochemistry-IV	02:00:01	30	0	15	45	3
Sem IV	FFD420	Microbiology-IV	02:00:01	30	0	15	45	3
	FFD130	Environmental Studies	03:00:00	45	0	0	45	3
								12
	FFE410	Biochemistry-V	04:00:02	60	0	30	90	6
Sem V	FFE420	Microbiology-V	04:00:02	60	0	30	90	6
								12
Sem VI	FFF410	Biochemistry-V	04:00:02	60	0	30	90	6
	FFF420	Microbiology-V	04:00:02	60	0	30	90	6
								12
Sem VII	FFG460	Food Chemistry	02:00:01	30	0	15	45	3
	FFG470	Product Development and Enterpreneurship	02:00:01	30	0	15	45	3
								6
Sem VIII	FFH480	Food Microbiology	02:00:01	30	0	15	45	3
	FFH490	Food Standards, Regulatory affairs and IPR issues	02:00:01	30	0	15	45	3
								6

FPB 010

JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE (AUTONOMOUS)

B.N ROAD, MYSURU – 25

SYLLABUS

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**

INDIAN CONSTITUTION
COMMON PAPER TO ALL DEGREE CLASSES (FOR B.Voc 45 HOURS 3/WEEK)

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

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

B.N ROAD, MYSORE.

DEPARTMENT OF ENVIRONMENTAL STUDIES

(3 Hrs Theory / week) 3 Credits (45 Hrs)

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, NOX, 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.

ಪ್ರಥಮಚತುರ್ಮಾಸ ಬಿ. ವೋಕ್ - 2021-22ನೇ ಸಾಲಿನ ಕನ್ನಡ ಭಾ ಾ ಪಠ್ಯಕ್ರಮಷ

ಘಟಕ- 1 ಕನ್ನಡ ನಾಡು- ನುಡಿ- ಚಿಂತನೆ

1. ಅ. ಕನ್ನಡಿಗರತಾಯಿ -ಎಂ ಗೋ ಪಿಂದ ಪೈ
   ಆ. ಹಚ್ಚೇವು ಕನ್ನಡದ ' ದೀಪ -ಡಿ ಎಸ್‌ಕರ್ಕಿ
2. ಕರ್ನಾಟಕ: ಇಟ್ಟ ಹೆಸರುಕೊಟ್ಟ ಮಂತ್ರ -ಕುವೆಂಪು
3. ಕನ್ನಡವನ್ನುಕಟ್ಟುವ ' ಕಲೆ ಸ - ಹಾ ಮಾ ನಾಯಕ

ಘಟಕ - 2 ಆಕಾಶ

1. ಅ. ಆಕಾಶ -ಸರಜೂಕಾಟ್ಕರ

   ಆ. ಕನೇವ -ವಿನಾಯಕ ಏ

2. ಆಕಾಶಕ್ಕೆ ನೀಲಿ ಪರದೆ -ಬೋಳುವಾರ ಮಹಮದ್‌ಕುಂಞ

ಘಟಕ - 3 ತಾರುಣ್ಯ

1. ಅ. ಬಡವನಾದರೆ ಏನು ಪ್ರಿಯೆ -ಸತ್ಯಾನಂದ ಪಾತ್ರೋಟ್ರೆ
   ಆ. ಕಾರಿಹಗ್ಗೆಡ ರೆ ತು ಮಗಳು -ಬಿ ಎಂ ಶ್ರೀಕಂಠಯ್ಯ
2. ಹದಿಹರೆಯದವರ ಅವಶ್ಯಕತೆಗಳು -ಸಿ.ಆರ್.ಚಂದ್ರಶೇಖರ

ಘಟಕ - 4 ಸಂಕೀರ್ಣ

1. ಅ. ಬಿನ್ನ ಭೇದವ ಮಾಡಬ್ಯಾಡಿರೋ -ಜನಪದ

   ಆ. ನೆತ್ತಮನಾಡಿ ಭಾನುಮತಿ ಸೋಲ್ತೊಡೆ -ಪಂಪ

2. ಈಗ ಬೀಜದ ಬುಟ್ಟಿಯಲ್ಲಿಯೋತ್ಪಾತಭ -
   ನಾಗೇಶ್ ಹೆಗಡೆ
3. ಅ. ಕನ್ನಡ ' ಮತ್ತುಗಣಕಯಂತ್ರ: ಕಂ ಪ್ಯೂ ಟರ್ ತಂತ್ರಾಂಶಗಳ ' ಪರಿಚಯ, ಅಂತರ್ಜಾಲ/ಇಂಟರ್‌ನೆಟ್, ಕನ್ನ ಡಿ ವೆಬ್‌ಸೈಟ್, ವರ್ಲ್ಡ್ ವೈಡ್ ವೆಬ್ ', ಶೋಧಯಂತ್ರ, ಮಿಂಚಂಚೆ/ಇ-ಮೆ ಲ್. ಆ. ರಜೆಅರ್ಜಿ, ಜ್ಞಾಪನ, ಸುತ್ತೋಲೆ

ಹೊಸರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣನೀತಿ : 2021-22

ಕನ್ನಡ ಭಾಷಾ ಮಾದರಿ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ

(1,2,3 ಮತ್ತು 4ನೇ ಚತುರ್ಮಾಸಗಳು)

ಅವಧಿ : 3ಗಂಟೆಗಳು ಗರಿಷ್ಠ ಅಂಕಗಳು : 60

1. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ 1x10=10

(ಘಟಕ -೧ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

2. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ 1x10=10

(ಘಟಕ -೨ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

3. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ 1x10=10

(ಘಟಕ -೩ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ

4. ಒಂದು ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸಿ 1x10=10

(ಘಟಕ -೪ ರಿಂದ ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

5. ಎರಡು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ 2x5=10

(ಘಟಕ ೧,೨,೩ ಮತ್ತು ೪ ರಿಂದ ಪದ್ಯ ಅಥವ ಪಾಠದಿಂದ ಎರಡು ಸಂದರ್ಭ ವಾಕ್ಯಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ;

ಪದ್ಯ ಅಥವ ಪಾಠದ ಆಶಯ, ಪಾತ್ರಚಿತ್ರಣ, ಸನ್ನಿವೇಶ ಚಿತ್ರಣ ಕುರಿತು ಎರಡು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

6. ಒಂದು ವಿಷಯ ಕುರಿತು ಬರೆಯಿರಿ 1x5=5

(ನಾಲ್ಕು ಘಟಕಗಳ ಪಠ್ಯದಲ್ಲಿನ ಒಂದು ವಿಷಯ ಕುರಿತು ವಿದ್ಯಾರ್ಥಿಗಳ ಸ್ವಂತ ಅನುಭವ, ಆಲೋಚನೆ , ಅಭಿಪ್ರಾಯ ಕುರಿತು ಪ್ರಶ್ನೆ ಕೇಳಲಾಗುತ್ತದೆ)

7. ಒಂದು ವಾಕ್ಯದಲ್ಲಿ ಉತ್ತರಿಸಿ 1x5=5

(ನಾಲ್ಕು ಘಟಕಗಳಲ್ಲಿ ಭಾಷಾಭ್ಯಾಸಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಪದಗಳ ಅರ್ಥ, ಪದವಿಂಗಡಣೆ , ನುಡಿಗಟ್ಟನ್ನು ಸ್ವಂತವಾಕ್ಯದಲ್ಲಿ ಬಳಸುವುದು , ಬಿಟ್ಟ ಜಾಗ ತುಂಬುವುದು ....ಇತ್ಯಾದಿ ಐದು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ)

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)

2020- 2021

DEPARTMENT OF MICROBIOLOGY

Revised Scheme of Instruction For B.Voc- Food Processing and Engineering 2019-20									
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	Fundamentals 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-I	2:0:1	30	0	15	45	3
		Semester-IV	Food Microbiology-II	2:0:1	30	0	15	45	3
Level- VII	**Degree**	Semester-V	Industrial Microbiology	4:0:2	60	0	30	90	6
		Semester-VI	Pathogenic Microbiology	4:0:2	60	0	30	90	6

Paper code: FPA520 **MICROBIOLOGY** **30hours-2 Credits**
I B.Voc., I Semester

TITLE: FUNDAMENTALS OF MICROBIOLOGY

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, Refigeration (4^0C) Lyophilization and cryopreservation.

UNIT-IV 08hrs

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.

1. General characteristics of bacteria, fungi, actinomycete, virus, protozoa and algae. Organization of cell wall, cell membrane, flagella capsules and formation of spores in bacteria.
2. 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

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**

Paper code: FPC520 **MICROBIOLOGY** **30hours-2 Credits**

II B.Voc.,III Semester

TITLE: FOOD MICROBIOLOGY-1

UNIT:I 10Hrs

A. Introduction to Food Microbiology: Definition, Concept and Scope. Food as a substrate for microorganisms. Food as a substrate for microorganisms, Factors influencing microbial growth in foods (intrinsic and extrinsic factors)**.**

B. 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

A. Methods of food preservation: Physical method – high temperature, low temperature, canning. Drying – solar drying, drum drying, spray drying. Radiation.

B. 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

A.Food borne intoxication and infection:

Bacterial intoxication- Botulism & staphylococcal intoxication

Bacterial infection- Salmonellosis.

Mycotoxin – Origin, types and importance of toxins with reference to Aflatoxins.

UNIT-IV 10 Hrs

A. Introduction to Dairy Microbiology: Source of milk contamination. Types of microorganisms in milk.

B. Methods to detect microbial spoilage by SPC, Reductase test.

C. Biochemical changes of milk - Souring, Gassy fermentation, Proteolysis, Lipolysis, and Ropiness.

D. Fermented dairy products (a brief account of characteristic and therapeutic value). Acidophilus milk, Yoghurt, Butter milk, Srikhand. Types of cheese. Probiotics and their benefits.

E. Preservation of milk and milk products – Pasteurization and Sterilization. Microbiological standard for milk and milk products (in brief).

PRACTICALS **3hrsX5 practicals**

1. Isolation and enumeration of microorganisms from spoiled fruits and vegetables
2. Isolation and enumeration of Microorganisms present in food Utensils.
3. Detection of number of bacteria in milk by SPC
4. Turbidity test to detect boiled and unboiled milk.
5. Methylene blue reductase test to determine the quality of milk.

Paper code: FPD520 **MICROBIOLOGY** **30hours-2 Credits**

II B.Voc., IV Semester

TITLE: FOOD MICROBIOLOGY-II

UNIT-I 06 Hrs

Food fermentations: Bread, cheese, vinegar, fermented vegetables, Fermented dairy products: Kefir, Kumiss, sour cream, dahi & lassi. Experimental and Industrial production methods. Oriental Fermented foods, their quality standards and control.

UNIT-II 06Hrs

Food produced by Microbes: Microbial cells as food (single cell proteins)- mushroom cultivation. Bioconversions- production of alcohol, fermented beverages- beer and wine & types of wine. Genetically modified foods.

UNIT-III 10Hrs

Detection of food-borne microorganisms: Culture, Microscopic and Sampling methods. Chemical: Thermostable nuclease *Limulus* Lysate for Endotoxins, Nucleic Acid (DNA) probes, DNA Amplification (PCR), Adenosine- Triphosphate Measurement, Radiometry, Fluoro-and Chromogenic substrates. **Immunologic Methods**: Fluorescent Antibody, Enrichment Serology, Salmonella 1-2. Test, Radioimmunoassay, ELISA.

UNIT-IV 08Hrs

Microbial indicators of food safety and quality control: Principles of quality control and microbiological criteria, Indicators of product quality and microbiological safety of foods, Hazard analysis and critical control points (HACCP), Good manufacturing process (GMP) Microbiological standards Codex Alimentarius and Food legislation.

PRACTICALS **3hrsX5=15 practicals**

1. Production of sauerkraut
2. Identification of Bacteria from idli batter and curds
3. Preparation of wine from grapes.
4. Role of yeast in bread making
5. Culturing of *Chlorella / Spirulina.*

Paper code: FPE520 **MICROBIOLOGY** **60 hours -4 Credits**

III B.Voc., V Semester

INDUSTRIAL MICROBIOLOGY-1

Unit –I **15hours**

A. Brief history and developments in industrial microbiology

B. Microorganisms of industrial importance; Isolation, Screening and Preservation of Industrial important microbes..

C. Strain improvement of Microorganisms for industrial purposes.

D. A brief account of production medium, inoculum medium, raw materials-Molasses, corn steep liquor, sulphite waste liquor, yeast extract and whey. Buffers, Precursors, Inhibitors and Antifoam agents.

Unit-II **15 hours**

A. .Fermenters and fermentation process: Design, types and basic function of fermenters, sterilization, devices for aeration and agitation (in brief).

B. Types of fermenters – laboratory, pilot-scale and production fermenters
Components of a typical continuously stirred tank bioreactor
Fermentation process – Surface, Submerged and Solid state fermentation. Types- Batch and Continuous fermentation.

Unit-III **15 hours**

Downstream processing: Steps in recovery and purification of fermented products – Precipitation, Filtration, Centrifugation, Distillation, Cell disruption, Solvent recovery, chromatography, Drying and crystallization.

UNIT: IV **15 hours**

Industrial production

A. a. Organic acids – Citric acid.
b. Antibiotics – Penicillin.
c. Enzymes –Pectinase and amylase.
d. Alcohol – Ethanol.
e. Amino acid –Glutamatic acid.

B**.** Role of microorganisms in the production and recovery of minerals and petroleum.

Practicals:

1. Preparation of alcohol using jaggery or molasses.
2. Estimation of percentage alcohol in a given sample by specific gravity method.
3. Production of citric acid using *Aspergillus niger*
4. Cultivation of edible mushroom
5. Isolation of antibiotic/ amino acid/organic acid producing microbes and their preservation.
6. Production of penicillin in the Laboratory
7. Antibiotic sensitivity test by Kirby-Baner method
8. Study of fermenters –Seed tank and Pilot scale
9. Production of any vitamin and its quantification by bioassay.
10. Alcoholic fermentation and determination of total acidity and non-reducing sugars

Paper code: FPF520 **MICROBIOLOGY** **60 hours -4 Credits**

III B.Voc., VI Semester

TITLE: PATHOGENIC MICROBIOLOGY

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 vizCryptococcosis, Dermatophytosis, Blastomycosis, Opportunisitc 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.
6. 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.

REFERENCES

Alexopoulos, C.J., Mims, C.W (1979). **Introductory Mycology**, Third edition. Weastern limited, New Delhi.

Alexopoulos, C.J., Mims, C.W.and Blackwell.M. (1996). **Introductory Mycology**, Fourth edition. Wiley eastern limited, New Delhi.

Ananthanarayana, C. and Paniker, C.K.J. (1996) **Textbook of Microbiology**, sixth edition. Orient Longman limited, Chennai.

Aneja, K.R. (1993). **Experiments in Microbiology,Plant Pathology.** Rasthogi and company, Meerut.

Atlas, R.M. (1986). **Basic and Practical Microbiology**. Macmillan Company. New York.

Balasubramanian,D.,Bryee,C.F.A., Dharmalingam,K., Green,K. and Jayaraman,K (1996).

Concepts in Biotechnology.Costed-IBN. University press.

Banwart, G.J. (1987). **Basic Food Microbiology**. CBS publishers and distributors, New Delhi.

Benson,H.J. **Microbiological applications- laboratory manual in general microbiology,** fifth edition.C.Brown publishers.

Cappuccino,J.G., And Sherman,N. (1999). **Microbiology- A Laboratory Manual,** Fourth edition.

Casida, Jr, L.E. (1996).**Industrial Microbiology**. New age International publishers, New Delhi.

Dubey,R.C. and Maheshwari, D.K. (1999). **A text book of Microbiology** .S.Chand and company limited , Ramnagar, New Delhi.

Frazier,W.C. and Westhoff,C.D. (1995). **Food Microbiology**.Tata McGraw- Hill publishing Company limited, New Delhi.

Freifelder,D. (1984). **Essentials of Molecular Biology**. Narosa Publishing House, New Delhi.

Gunashekaran,P. (1996). **Laboratory Manual in Microbiology**. New age International Pvt limited publishers, New Delhi

Gupta,R.K. (1993-94). **Cytology, Genetics, Biotechnology and Biostatistics**. Rastogi

Publications, meerut.

Gupta,R.K.(1996) **.Elements of Biotechnology**. Rastogi Publications, meerut.

Gupte,S.M.D.(1986). **The Short Text book of Medical Microbiology**.Jaypee Brothers Medical Publishers, New Delhi.

Jay,J.M. (1987).**Modern Food Microbiology**. CBS publishers and distributors, New Delhi.

Joshua, A. (1998). **Microbiology,** Fourth edition. Popular Book Depot, Chennai.

Kumar, H.D. (1997). Molecular Biology and Biotechnology**, second edition. Vikas publishing House Pvt Ltd,New Delhi.**

Kumar, H.D. and Swathi Kumar (1998).**Modern Concepts of Microbiology**. Vikas publishing House Pvt Ltd, New Delhi.

Mani, A., Selvaraj, A.M. Narayanan, L.M. and Armugam, N. (1996). **Microbiology General and Applied**. Saros publication.

Mitchell,R. (1992). **Environmental microbiology.** Wiley- Liss, Inc. New York.

Moore ,L.E. (1982). **Fundamentals of the Fungi,** Second edition. Prentice Hall, Inc New Jersey. In aghriculture.

Natesh, S., Chopra, V.L. and Ramachandran, S. (1994). **Biotechnology in Agriculture.** Oxford IBH publishing company Ltd. New Delhi.

Pelczar, Jr, J.M., Chan, E.C.S .and Kreig, N.R. (1993). **Microbiology.** Tata McGraw- Hill publishing Company limited, New Delhi.

Powar and Daginwala. (1996). **General Microbiology**, Vol I. Himalaya publishing House Bombay.

Powar and Daginwala.(1996). **General Microbiology**, Vol II. Himalaya publishing House Bombay.

Prescott, L.M., Harley, J.P. and Klein, D.A. (1999**). Microbiology**, International edition, Fourth edition, WBC Mc Graw Hill.5.

Rangaswamy.G.(1996). **Diseases of crop plants in India**. 3 rd edition .Prentice- Hall of India Pvt Ltd. New Delhi.

Rao,A.S. (1997). **Introduction to Microbiology**. Prentice- Hall of India Pvt Ltd. New Delhi

Rao, M.N. and Datta, A.K. (1987). **Waste water treatment.** Oxford IBH ublic

Salle, A.J. (1967).**Fundamentals principles of Bacteriology**, Sixth edition. Tata McGraw- Hill publishing Company limited, New Delhi.

Seeley, H.W.Jr. and Denmark, J.V. (1972).**Microbes in Action-A laboratory Manual of Microbiology.**D.P.Taraporevala Sons and Co., Ltd, Bombay.

Sharma,P.D. (1999).**Microbiology** Rostogi and company,Meerut.

Shasstry K.S., Padmanabhan, G. and Subramanian, C. **A Text Book of Molecular Biology**.

Mac Millan Publications India Ltd, New Delhi.

Sullia, S.B. and Shantharam, S. (1998). **General Microbiology**. Subbarao, N.S. (1986) Oxford IBH publishing company Ltd. New Delhi.

Verma,S.K. (1999). **A Text Book of Biotechnology.** S. Chand and company Ltd, New Delhi.

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+

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

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)

2021 - 2022

DEPARTMENT OF BIOCHEMISTRY

Scheme of Instruction For B.Voc- Food Processing and Engineering 2021-22									
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	Biochemistry and Nutrition-1	4:0:2	60	0	30	90	6
		Semester-VI	Biochemistry and Nutrition-2	4:0:2	60	0	30	90	6
Level- VIII	**Degree Honors**	Semester-VII	Food Chemistry	2:0:1	30	0	15	45	3

SEMESTER I

Paper -I **(30 hours -2 Credits)**

BIOMOLECULES

SECTION-I : Amino Acids & Proteins: **09 Hrs**

1. Introduction to Bio-chemistry.
2. **Amino Acids:** Definition, biological functions of Amino acids. Classification based on the nature of "R" groups (Polarity). Stereoisomerism and RS system of designating optical isomers (D & L rotation). Protein and non-protein amino acids. Specialized role of amino acids. Physical and Chemical properties of amino acids. Titration curve of amino acids.
3. **Proteins:** Peptide bond formation and structure, classification of proteins based on structure with examples. Secondary structure**: -** α-Helix, β-sheet, β-barrel and β-turn. Tertiary structure – Fibrous proteins (collagen) and Globular proteins (Myoglobin). Quaternary Structure– hemoglobin. Denaturation and renaturation of proteins by Anfinsen's experiment. Salting in & salting out of proteins.

SECTION-II: Carbohydrates: **08 Hrs**

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

SECTION-III: Lipids **08 Hrs**

1. Definition and classification and biological functions of lipids, fatty acids (saturated and unsaturated). Essential fatty acids and its functions. Physical properties of lipids- melting point, boiling point and their relation to molecular size. Fats as source of energy. Waxes.
2. Structures and functions of Lipids: Triacylglycerols, phospholipids: lecithins (PhosphotidylCholines), cephalins (Phosphotidylethanolamines), Phosphatidylserines, phosphatidyl inositol, sphingomyelins, plasmalogens), cerebrosides, gangliosides.
3. Lipoproteins—Composition, classification and biological functions.
4. Prostaglandins, Leukotrienes, Thromboxanes and their importance.

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.

PRACTICALS **(15 Hrs -1 Credit)**

1. Calibration of volumetric glassware's (Burette, pipette). **3 Hrs**
2. Qualitative tests for : (a) Carbohydrates. (b) Amino acids and proteins (c) Cholesterol and lipids **3 Hrs X 2**
3. Estimation of amino acid by formal titration **3 Hrs**
4. Estimation of reducing sugars by DNS method **3 Hrs**

Semester II

Paper II **(30 hours – 2 credits)**

ENZYMOLOGY AND BIOENERGETICS

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. Theories of enzymes catalysis: Acidbase catalysis, covalent catalysis.

SECTION-II: Enzyme Purification : **08 hrs**

Isolation and purification of enzymes- Preliminary fractionation procedures and precipitation techniques. Chromatography methods: Principle, Construction and applications of Gel filtration, adsorption, ion exchange and affinity chromatography. 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 Km and its significance.
Enzyme inhibition- Reversible inhibition (competitive, uncompetitive, non-competitive). Antibiotics as inhibitors. Allosteric enzymes and enzyme regulation. Isoenzymes and their clinical significance.

SECTION-IV: Bioenergetics **05 hrs**

Laws of thermodynamics, Entropy, Enthalpy, Gibbs free energy. Types of rections- Endergonic & Endergonic. Structure and role of ATP & other high energy compounds (Phosphocreatine, phosphoenolpyruvate). Redox reactions, Redox potential and its applications. Commercial importence of enzymes

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 Km and Vmax **3 Hrs**
5. Effect of activators (NaCl) on salivary enzyme activity **3 Hrs**

Semester III

Paper – III **(30 hours-2 Credits)**

METABOLISM

SECTION-I: Carbohydrate Metabolism **08 Hrs**

Digestion, Absorption and transport of Carbohydrates, Metabolic Pathways- Glycolysis, TCA cycle, Pentose Phosphate Pathway, Glucuronate pathway, 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: Protein Metabolism **08 Hrs**

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: Nucleic acid Metabolism **06 Hrs**

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

PRACTICALS **(15 Hrs = 1 Credits)**

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**

Semester IV

Paper IV **(30 hours -2 Credits)**

BIOCHEMICAL TECHNIQUES

SECTION-I: Spectroscopic Techniques **8 Hrs**

:

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: Electrophoretic & Centrifugation Techniques **8 Hrs**

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

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

SECTION-III: Chromatographic Techniques **8 Hrs**

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: Radio Isotopic Techniques **6 Hrs**

Properties of radioactive emissions. Units of radioactivity. Isotopes and their applications in biological studies - ^{3}H, ^{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.

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**
6. Estimation of protein by Lowry/BCA method. **3 Hrs**

Semester V

Paper V **(60 hours-4 Credits)**

BIOCHEMISTRY AND NUTRITION-1

SECTION-I: Introduction **15 Hrs**

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 calorometric 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

Water Metabolism: Distribution in the body, factors maintaining water balance and factors influencing water balance

SECTION-II: Proteins **15 Hrs**

Review of functions of proteins in the body, Digestion and absorption. Essential and Nonessential amino acids. Amino Acid Availability Antagonism, Toxicity and Imbalance, Amino acid Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value, Nitrogen balance. PEM and Kwashiorkor

SECTION-III: Vitamins **15 Hrs**

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

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

SECTION-IV: Minerals **15 Hrs**

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.

PRACTICAL **(30 Hrs = 2 Credits)**

1. Estimation of haemoglobin in blood. **3Hrs**
2. Identification of Sugars in fruit juice using paper chromatography. **3Hrs**
3. Estimtion of vitamin E in serum. **3Hrs**
4. Determination of proteins by dye binding assay. **3Hrs**
5. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate **3HrsX3**
6. Detection of adulterants in food. **3Hrs**
7. Estimation of Calcium in ragi. **3Hrs**
8. Estimation of Vitamin – C in lemon or gooseberries by DPPH method **3Hrs**

SEMESTER VI

Paper -VI **(60 hours -4 Credits)**

BIOCHEMISTRY AND NUTRITION-2

SECTION-I: Dietary Carbohydrates & Health **15 Hrs**

Review functions of carbohydrates. Digestion, absorption, utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fiber in lipid metabolism, colon function, blood glucose level and GI tract functions.

SECTION-II : Dietary Lipid & Health **15 Hrs**

Review of classification, sources, functions, digestion, absorption, utilization and storage. Essential Fatty Acids; Functions of EFA, RDA, – excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the following: a) Omega – fatty acids. Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary implications of fats and oils, Combination ratios of n6 and n3, MUFA, PUFA and SFA

SECTION-III : Digestion & Antinutritional factors **15 Hrs**

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

Digestion, absorption and transport of Proteins.

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 adultrants- structure and harmfull effects of - Butter yellow, lead chromate and malachite green.

SECTION-IV- Assessment of Nutritional Status, Food & Drug Interactions **15 Hrs**

Anthropometric measurements; Z scores, BMI, skinfold, circumference ratios. Biochemical assessment; Basal metabolic panel, Comprehensive metabolic panel, CBC, Urine Analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate.

Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Antidepressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition. Food as medicine.

PRACTICAL **(30 Hrs = 2 Credits)**

1. Estimation of DNA by diphenylamine method.	**3Hrs**
2. Determination of saponification value of an oil or fat.	**3Hrs**
3. Determination of Iodine value of an oil or fat.	**3Hrs**
4. Determination of Acid value of an oil or fat.	**3Hrs**
5. Estimation of SGPT in serum	**3Hrs**
6. Estimation of SGOT in serum.	**3Hrs**
7. Extraction of RNA from yeast and its estimation by Orcinol method.	**3Hrs**
8. Determination of total protein and A/G ratio in serum.	**3Hrs**
9. Estimation of serum phospholipids.	**3Hrs**
10. Immobilization of enzymes/ cells by entrapment in alginate gel	**3Hrs**
11. Demonstration of ELISA	**3Hrs**

SEMESTER VII

Paper VII: Food Chemistry Theory: 30 Hrs

Sl. No.		Hrs
1.	Introduction to food chemistry, its role in processing and food formulations	1
2.	Moisture in foods: Role and type of water in foods, Functional properties of water, role of water in food spoilage, Water activity and sorption isotherm, Molecular mobility and food stability.	2
3.	Dispersed systems of foods: Physicochemical aspects of food dispersion system: a) Sol b) gel c) foam d) emulsions.	1
4.	Carbohydrates: Functional characteristics of different carbohydrates. Maillard reaction, caramelization, methods to control non enzymatic reactions. Starch and Dietary fibres, Functional properties of polysaccharides, natural vegetable gums, carbohydrate composition of various natural foods.	5
5.	Proteins in foods: Protein content and composition in various foods- cereal grains, legumes and oilseed proteins, proteins of meat, milk, egg and fish. Functional properties of proteins in foods – water and oil binding, foaming, gelation, emulsification. Effect of processing on functional properties of proteins-heat processing alkali treatments, chilling, freezing, dehydration and radiations. Unconventional sources of proteins- SCP fish protein concentrates, leaf proteins	5
6.	Lipids in foods: Role and use of lipids /fat, occurrence, fat group classification, Physicochemical aspects of fatty acids in natural foods, hydrolysis, reversion,. Chemical aspects of lipolysis, auto-oxidation, antioxidants, Technology of fat and oil processing: Refining, Hydrogenations, Inter etherification, Safety use of oils and fats in food formulation.	5
7.	Vitamins and minerals, Dietary sources, requirements, Allowances, Enrichment, Restorations, Fortifications, Losses of vitamins and minerals, Optimization and retention of vitamins and minerals	2
8.	Enzymes in food industry, Carbohydrases (Amylases, cellulases, pectinases,) Proteases, Lipases and oxidases in food processing.	2
8.	Chemistry of food flavour: definitions of flavour, Flavourmatics / flavouring compounds, Sensory assessment of flavour, Technology for flavour retention.	2
9.	Food colours, natural and synthetic, Regulatory aspects –Natural and synthetic permitted food colours.	1
10.	Food toxicants – anti nutritional factors and their occurrence, effects and methods of elimination or inactivation- protease inhibitors, lectins, lathyrogens, phytates and flatulence factors.	2
11.	Food Contaminants, Pesticidal residues – permitted limits. Toxicology and	2

public health.

Sl. No.	Practical	Hrs
1.	Determination of moisture content of foods using different methods	3
2.	Determination of crude proteins by microkjeldahl method	3
3.	Determination of crude fat by soxlet method	3
4.	Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility).	3
5.	Determination of minerals and acid insoluble ash and estimation of Calcium and phosphorus	3
6.	Assay of amylases, papain and lipases	3
7.	Estimation of iron in drumsticks	3
8.	Determination of food colors	3

REFERENCES

1. Title- Basic Inorganic chemistry, 2nd edn.,Author-Cotton,F.A.,Gaus,P.I and Wilkinson,G.(1986),
2. Publication - John Wiley
3. Title - Fundamentals of general organic chemistry and biological chemistry, 4th edn, Author-Holum,J.R.(1990), Publication- Wiley International.
4. Modern Inorganic chemistry,Jolly,W.L.(1984), McGraw Hill
5. Concise Inorganic Chemistry,4th edn, Lee,J.D.(1991),Chapman and Hall
6. General Chemistry,5th edn,Petrucci,R.H.(1989), Collier MacMillan
7. Principles Of Inorganic Chemistry,20th edn., Puri.B.R and Sharma,L.R.(1989), S.L.N.Chand and Co.
8. Textbook of Inorganic Chemistry,19th Revd.,Soni,P.L.(1989),Sulthan Chand and Sons.
9. General and Inorganic Chemistry I and II(1989,1990), Prasaranga, BangaloreUniversity.
10. Physical Chemistry For The Life Sciences,Barrow,G.M.(1974)
11. Modern Physical Chemistry, Liptrot,G.T., Thompson.J.J.and
12. Walker,G.R.(1982),ELBS/Bell and Hyman.
13. A Biologists Physical Chemistry, 2nd edn.,Morris,J.G.(1974), Edward Arnold.
14. Principles Of Physical Chemistry,30th edn.,Puri,B.R.,Sharma,L.R. and Pathania,N.S.(1989),S.L.N.Chand and Co.
15. Physical Chemistry Of Biological Systems,Raymond Change
16. Textbook Of Physical Chemistry,17th revd. Edn.,Soni,P.L. and Dharmarha,D.P(1990),Sulthan Chand and Sons.
17. Basic Physical Chemistry For The Life Sciences,2nd edn.Williams,V.R. and Williams,H.B.(1973),Freeman.
18. Physical chemistry, I and II(1988,1990),Prasaranga,Bangalore University.
19. Principles of instrumental analysis- D.A. Skoog, Holt-Saunders -1985.
20. Laboratory manual of Biochemistry- J.Jayaraman, Wiley Eastern
21. Laboratory Techniques in Biochemistry and Molecular Biology – Work and work
22. Molecular Biology and Biotechnology – 3rd Edition Ed. J. M. Walker and E. B. Gingold - Published by The Royal Society of Chemistry

23. Biochemistry of Lipid and Membranes – D. E. Vance and J. E. Vance (Eds.)

24. Principles of Biochemistry – General Aspects. White, Handler and Smith

25. Basic Principles of Organic Chemistry – Roberts and Caserio

26. Genetics - Strickberges

27. Gene Expression – R. E. Glass - 1983

28. Microbial Genetics – D. Friefelder, 1997

29. Cell and Molecular Biology - R. Schlief - 1987

30. Genetics of Bacteria and their Viruses - W. Hayes.

31. The Molecular Biology of the cell – Alberts *et al*., 1983

32. Plant Molecular Biology – A practical Approach - C. H. Shaw

33. Bacterial Plasmids – P. Breda

34. Genetic Engineering, Vol. 1-4, Villiamson (Eds.)

35. Genetic Engineering, Vol. 1-7, Setlow and Bolander (Eds.)

36. Gene Cloning – Glover, 1984

37. Recombinant DNA - Watson *et al.,* 1983

38. Esssentials of Immunology – Roitt, I. M. , 1983

39. Monoclonal Antibodies – Priniciples and Practice - J. W. Goding, 1983

40. Hybridoma Techniques – A Laboratory Course – Muthukkarppan, V. K. , Baskar, S., and Sinigagalia, F. 1986

41. Vaccines 86: New Approaches to immunisation – Brown, F., Chanak, R. M. and Lerner, R. A. ED. 1986

42. Moleculsar Biology of the Gene – J. D. Watson

43. Molecular Cell Biology – Darnell *et al*.

44. The Gene - Levine

45. Biostatistical Analysis – Zar, J. H. 1984

46. Statistics and Experimental Design – Clarke, G. M. 1980

47. Microbial Products, Biomass and Primary Product – Rehm, H. J. and Reed, G. Vol. 3

48. Food and Feed Production with Microorganisms - Rehm, H. J. and Reed, G. Vol. 5

49. Microbial Transformations and special Processes - Rehm, H. J. and Reed, G. Vol. 6

50. Plant Biotechnology – King, S. D. and Arntzen, C. D., 1989.

51. Somaclonal Variation in Crop Improvement – Bajaj, Y. P. S., (Ed.) 1990.

52. Haploids in Crop Improvement – Bajaj, Y. P. S., (Ed.) 1990.

53. Comprehensive Biotechnology - Vols. 2, 3, & 4. M. Moo-Yound, Ed. 1985.

54. Fundamentals of Biotechnology – P. Prave, V. Paunt, W. Sitting and D. A. Sukatesn (Ed.) 1987

55. Biochemical Engineering Fundamentals – J. E. Bailey and D. F. Ollis, !977.

B.Voc Degree Examinations according to NEP 2021

60 : 40 pattern

Theory papers: Total marks = 100 marks

C1= 20 marks(IA)C2= 20marks(IA)

C3= 60marks (Main exam.)

Practical papers: Total marks = 50 marks

C1= 10 marks (IA)

C2= 10 marks(IA) +05(Record)

C3= 25 marks (Main Exam.)

IA = Internal assessment (Assignment/seminar/test/viva-voce).

B.Voc. DEGREE EXAMINATION

MODEL QUESTION PAPER

BIOCHEMISTRY

TIME : 2.30 hrs **MAX. MARKS: 60**

NOTE: ALL SECTIONS ARE COMPULSORY

SECTION – A

1. Answer any FIVE of the following 5 x 2 = 10

   a.
   b.
   c.
   d.
   e.
   f.
   g.

SECTION – B

Answer any FOUR of the following 4x 5 =20

2.
3.
4.
5.
6.
7.

SECTION – C

Answer any THREE of the following 3 x 10 = 30

8.
9.
10.
11.
12.

Note*: section C may include sub questions a, b*

B.Voc DEGREE EXAMINATION

MODEL QUESTION PAPER (PRACTICALS)

BIOCHEMISTRY

Time: 3 h **Max. Marks: 25**

1.	Write the principle and procedure of_____experiment	05
2.	Major experiment (Conduct and report the results)	15
3.	Viva-voce	05

B.Voc Semester - IV

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

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)

2021-22

DEPARTMENT OF COMPUTER SCIENCE

Revised Scheme of Instruction for B.Voc – Food Processing & Engineering 2016-17							
General Education Component – Computer Science							
Semester	**Title**	**L: T: P**	**Theory Hrs**	**Tutorial Hrs**	**Practical Hrs**	**Total Hrs**	**Credits**
Semester I	COMPUTER FUNDAMENTALS & DOS	2:0:1	30	0	15	45	3
Semester II	C PROGRAMMING	2:0:1	30	0	15	45	3

SEMESTER I

COMPUTER SCIENCE

PAPER - I

COMPUTER FUNDAMENTALS & DOS

(2 hrs theory / week) **30 hours - 2 Credits**

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

BCA Question Paper Pattern

Time 3 Hours Max. Marks: 60

Part A

I. Answer any 2 sub questions from each main 3 X 10 = 30

1. A. 2 X 5 = 10
   B.
   C.

2. A. 2 X 5 = 10
   B.
   C.

3. A. 2 X 5 = 10
   B.
   C.

Part B

II. Answer all Questions from the following 3 X 10 = 30

4. A. 10
   OR
   B. 10

5. A. 10
   OR
   B. 10

6. A. 10
   OR
   B. 10

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

BSc Question Paper Pattern

Time 3 Hours | Max. Marks: 60

Part A

I. Answer all Questions from the following | 04 X 05 = 20

1. A. | 05
   OR
   B. | 05

2. A. | 05
   OR
   B. | 05

3. A. | 05
   OR
   B. | 05

4. A. | 05
   OR
   B. | 05

Part B

II. Answer all Questions from the following | 04 X 10 = 40

5. A. | 10
   OR
   B. | 10

6. A. | 10
   OR
   B. | 10

7. A. | 10
   OR
   B. | 10

8. A. | 10
   OR
   B. | 10

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

BCA / B.Sc. Question Paper Pattern

Time 2 Hours Max. Marks: 30

Part A

I. Answer any Five sub questions from the following 05 X 02 = 10

1. A.
   B.
   C.
   D.
   E.
   F.

Part B

II. Answer any Four questions from the following 04 X 05 = 20

1. A.
   B.
   C.
   D.
   E.

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

B.N ROAD, MYSORE.

DEPARTMENT OF ENVIRONMENTAL STUDIES

(3 Hrs Theory / week) 3 Credits (45 Hrs)

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, NOX, 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.

B.Voc Semester - III

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

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)

2021-2022

DEPARTMENT OF FOOD PROCESSING AND ENGINEERING

General Component

Semester - VII

Sl. no.	PRODUCT DEVELOPMENT AND ENTRPREUNERSHIP	Hrs
1	Sensory evaluation of foods - Importance, need and application for product formulation, Basic tastes, threshold tests for basic tastes, Sensory panel, type, selection and training. Types of sensory tests- Subjective and objective sensory evaluation. Instrumental tests for sensory attributes – color, texture and odor.	8
2	Product Development - Designing new product – types and drawing forces, Need for product development. Stages of product development, Consumer research. Role of sensory evaluation in consumer product acceptance.	5
3	Entrepreneurship - Starting and managing an enterprise - Steps in preparing a business plan, Components of management, Developing managerial skills, Managing a food industry. Factors influencing entrepreneurship groups Qualities of an entrepreneur	6
4	Consumer Behaviour & Marketing - Factors influencing food purchases, product acceptance, purchasing trends. Changing food trends.	3
5	Special food processing technologies and novel food ingredients – Membrane technology (reverse osmosis and ultra-filtration), agglomeration, agitation, air classification, extrusion, automation in food industries.	8

Sl. no.	Practical	Hrs
1	Sensory analysis: Different types of sensory tests for basic tastes and sensory attributes of products.	5
2	Project on different sensory techniques and responses utilizing prepared food products, analysis and presentation of sensory data.	3
3	Stepwise development of a new food product, standardization, acceptability studies and submission of project report.	4
4	Survey on types of convenience foods / consumer behaviour / analysis of food labelling.	3

General Component

Semester – VIII

Sl. No.	Food Standards, Regulatory Affairs and IPR Issues	Hrs
1.	Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to food safety	3
2.	Principles of food quality assurance, total quality management (TQM)–good manufacturing/management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control	3
3.	Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents	3
4.	Food safety management, applications of HACCP in food safety, concept of food trace ability for food safety, Food safety and Standards Act 2006: salient provision and prospects	3
5.	Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI)	3
6.	Introduction to WTO agreements: SPS and TBT agreements, Codex Alimentarious Commission ,, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161,ISO 14000)	5
7.	Food safety in USA, USFDA, Legislation in Europe: Directives of the official journal of the EU, council regulations, food legislation in UK. Regulating methods for food analysis, case studies. Enforcers of Food Laws Approval Process for Food Additives ,Nutritional Labeling	5
8.	Concept of property, rights, duties and their correlation; History and evaluation of IPR; Copyrights and related rights. Distinction among Various forms of IPR. Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical	5

	indication and Industrial design	
Sl. No.	**Practical**	**Hrs**
1.	Study of food regulations in various countries ; study of nutritional labeling of packaged food items by visiting food market, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA Study of patent law in India and the procedure for grant of patent in India	15

M.Voc (Food Processing and Engineering) Syllabus		
1st -M.Voc NSQF Level: 8 – Semester I & II Sub Sector: Fruits & Vegetables Job Role: Head of Production		
UNIT I		
Post Harvest Management of Fruits		
S.No	THEORY	Hrs
1.	General Introduction of fruits-citrus, tropical and subtropical, pome, stone, soft, and berry fruits, melons and watermelons	1
2.	Importance and scope of post harvest management of fruits, Morphology, structure and composition of fruits	2
3.	Maturity Indices and standards for standards for selected fruits, methods of maturity determination	2
4.	Post-harvest physiological and biochemical changes in fruits; ripening of climacteric and non-climacteric fruits	2
5.	Harvesting and handling of important fruits. Harvesting tools; field heat removal/precooling of fruits. Sorting and grading at farm and cluster level; factors affecting post harvest losses	2
6.	Nature of post harvest deterioration; physiological change- physical damage; chemical injury-pathological decay; identification of diseases and disorders in fruit-nutritional disorders, respiratory disorders, temperature disorders and miscellaneous disorders. Classification of diseases and diseases organisms, types of diseases and agents of diseases in fruits.	4
7.	Pre-cooling of fruits and cold storage, zero energy cool chamber	3
8.	Shelf life enhancement- permitted chemicals for ripening, wax coating	3
9.	Storage practices: Refrigerated storage, modified atmospheric storage-novel MAP gases and their role, novel MAP applications, Applying high oxygen MAP; MAP of minimally processed fruits; controlled atmosphere storage/ultra low oxygen storage of fruits, recent advances in CAP and MAP	9
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Familiarization of various fruits available in India and categorization of fruits used for pulping	3
2.	Studies on morphological features of some of the fruits	3
3.	Studies on maturity indices; Studies on harvesting of fruits	3
4.	Studies on permitted chemicals for ripening and enhancing the shelf life of fruits	3
5.	Studies on regulations of ripening of banana and mango	3
6.	Studies on physiological disorders like chilling injury of certain fruits	3
7.	Studies on pre cooling and storage of fruits and vegetables	3
8.	Demonstration on wax coating on apples, citrus and Mango	3
9.	Studies on various storage systems and structures;	3
10.	Studies on pre packaging of whole and cut vegetables	3
11.	MAP of minimally processed fruits & vegetables	3
12.	Visit to commercial packaging houses for mango, banana, pomegranate, grapes	3
13.	Visit to Controlled Atmospheric packaging centres	4

14.	Visit to commercial storage structures for onion and potato	4
15.	Visit to multi chamber cold storages for fruits and vegetables	4
16.	Visit to Fruit Orchards -Observations on Pruning, orchard Hygiene, Irrigation, Manuring, Insect Pests, Pathological Spoilages, Pre-harvest spray schedules to control pathological spoilages and insect infestation	4
17.	Visit to Fruit Orchards - Studies on Causes for pre and post harvest losses. Spoilage factors, post harvest field operations including methods to reduce the post harvest losses	4
	TOTAL	**56**
UNIT II		
Technology for processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Process of receiving, ripening, checking raw material quality, sorting, washing, cutting/slicing, deseeding/destining, pulping, precooking/pasteurization, sterilizing, aseptic packaging or canning, retort pouching, sampling for quality analysis and storing	2
2.	Machineries and tools used for the fruit pulping process such as fruit washer, peeler, slicer, fruit pulper, steam jacketed kettles, packaging machines etc	2
3.	Quality assessment of packaging materials	2
4.	Enzymes in quality and processing of tropical and sub tropical fruits	3
5.	Non thermal processing methods-ultra violet light, high pressure processing, ultrasound, ozone application, irradiation, pulsed electric field	7
6.	Introduction, canning machineries, various steps involved in canning of fruit pulp, syrup preparation, pretreatment for canning operation	7
7.	Canning of various fruits, process flow diagram for canning, filling, exhausting, sealing and processing operations	5
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Canning of mango pulp	5
2.	Canning of tomato pulp	5
3.	Preservation of tomato pulp by chemical preservation method	5
4.	Preservation of banana pulp by freezing method	5
5.	Canning of mango slices in syrup	5
6.	Canning of pineapple slices in syrup	5
7.	Canning of banana slices in syrup	5
8.	Visit to fruit processing units and collection of data on wastes and by products	5
9.	Visit to Aseptic packing units for fruit pulps & concentrates	8
10.	Visit to the pilot plants of CFTRI & DFRL Mysore	8
	TOTAL	**56**
UNIT III		
Food Quality and Food Microbiology		
S.No	**THEORY**	**Hrs**
1.	Introduction – definition, historical development and significance of food microbiology; Microscope; Classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; Anti-microbial agents – physical & chemical – mechanism & action	3
2.	Sources of Contamination: Air, Water, Soil, Sewage, Post processing Contamination. Intrinsic &extrinsic factors influencing the growth of Microorganisms in foods	3

3.	Disinfection & disinfectants; Energy metabolism of aerobic & anaerobic microbes; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization	4
4.	Microbiology of Fruits and vegetables and their products like jam, jelly, sauce, juice/pulp	3
5.	Food Quality aspects of Fruits & vegetables; Introduction, Quality principles, Quality enhancement model. Application of quality enhancement model	3
6.	Food Waste Treatment : Liquid waste, Solid waste vessel containers & wrapping waste, Hazardous waste .Quality and Safety of Frozen Foods: Fruits, Vegetable	3
7.	Measuring and Controlling Devices: Role of transducers measurements in food processing; Humidity, Turbidity and Color, Food & Process temperature controller and indicators. Statistical Quality Control for food Industry : Food Quality System, Fundamentals, Process control implementing quality control program, six sigma, RSM	4
8.	Food additives – preservatives, antioxidants, sequestrates, surface active agents, stabilizers and thickeners, bleaching and maturing agents, starch modifies, buffers, acids, alkalis, food colors, artificial sweeteners, nutritional additives, flavoring agents.	5
	TOTAL	**28**
	PRACTICALS	3
1.	Determination of firmness of fruits	3
2.	Determination of moisture content	3
3.	Titratable acidity estimation	3
4.	Estimation of SO2 in food sample	3
5.	Estimation of sodium benzoate in food sample	3
6.	Estimation of polyphenol and polyphenol oxidase	3
7.	Estimation of Reducing sugar, Non-reducing and total sugars	3
8.	Determination of organic acid content	3
9.	Ascorbic acid estimation	3
10.	Determination of pH in food products	3
11.	Determination of total Ash	3
12.	Determination of total soluble solids	3
13.	Estimation of ash content	3
14.	Estimation of crude fibre	3
15.	Estimation of pectin	3
16.	Flow process chart of food plant Waste utilization processes, various treatment for waste disposal analysis of cleaners & sanitizers, CIP Cleaning	11
	TOTAL	**56**
UNIT IV		
Food Safety, Hygiene and Sanitation for Processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Food safety, hygiene and sanitation for processing of fruit pulp: food safety standards and regulations for fruit pulp, definition of hygiene, hygiene practices and its importance at every stage of fruit pulp processing at industrial level; personal hygiene requirements; physical, chemical and biological hazards and methods for prevention of various hazards; CIP and COP methods and procedures, GHP, GMP and HACCP; waste management-pre and post production.	14

2.	Microbiological aspect of Food; types of food microbes, causes of food spoilage, types of food spoilage/deterioration, criteria to check the food spoilage, need for food preservation, different types of food preservation methods, method of assessing the quality of products based on physical parameters	14
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Clean and maintenance of work area using appropriate sanitizers, ensure the work area safe and hygienic for fruit processing, disposal of waste material as per SOPs and industrial requirement	8
2.	Check the working and performance of machineries and tools for fruit pulp process, clean the machineries and tools used with recommended sanitizer, to place the necessary tools required for the process, to attend minor repair, faults of all machineries if required.	8
3.	Dissembling and assembling of machineries used in fruit pulp industry (Fruit mill, crusher etc)	8
4.	Demonstration of CIP and COP methods of cleaning the machines with approved sanitizers	8
5.	Visit to industry to learn about GHP, GMP, HACCP	12
6.	Visit to industry to learn about waste management pre and post production	12
	TOTAL	**56**
S.No	**UNIT V**	**Hrs**
Plant Design, Plant Economics and Plant Management		
1.	Food Industry management- location of plant land and building requirements, plant capacity, plant and machinery requirement, building and plant layout, utilities, byproducts, waste, energy and safety audit, manpower requirements	5
2.	Introduction to economics: Meaning, scope, and contribution to business decisions. Analysis of Demand: Law of demand, Utility function, Rate of commodity substitution, Maximization of utility, Demand functions, Indifference curve analysis, Substitution and income effects. Market demand and demand elasticities: concept of market demand, price and income elasticities of demand, importance of elasticity. Demand forecasting: causes and techniques of demand forecasting	6
3.	Analysis of supply and market equilibrium: Law of supply, price elasticity of supply, equilibrium of demand and supply. Theory of the Farm: Production function, returns to scale, Optimizing behavior, Input demands, Cost functions, Profit maximization, economics & diseconomies of scale, break even analysis. Market structures perfect competition: Profit maximization and equilibrium of firm and industry, Short run and long run supply curves; Price and output determination, practical applications	6
4.	Plant maintenance program; Role of maintenance staff and plant operators, Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants; Work place improvement through '5S'. Hygiene and sanitation requirement in food processing and fermentation industries; CIP methods, sanitizing & disinfestation, pest control in food processing; storage and service areas	6
5.	Supply chain management for fruits	5
	TOTAL	**28**
PRACTICALS		

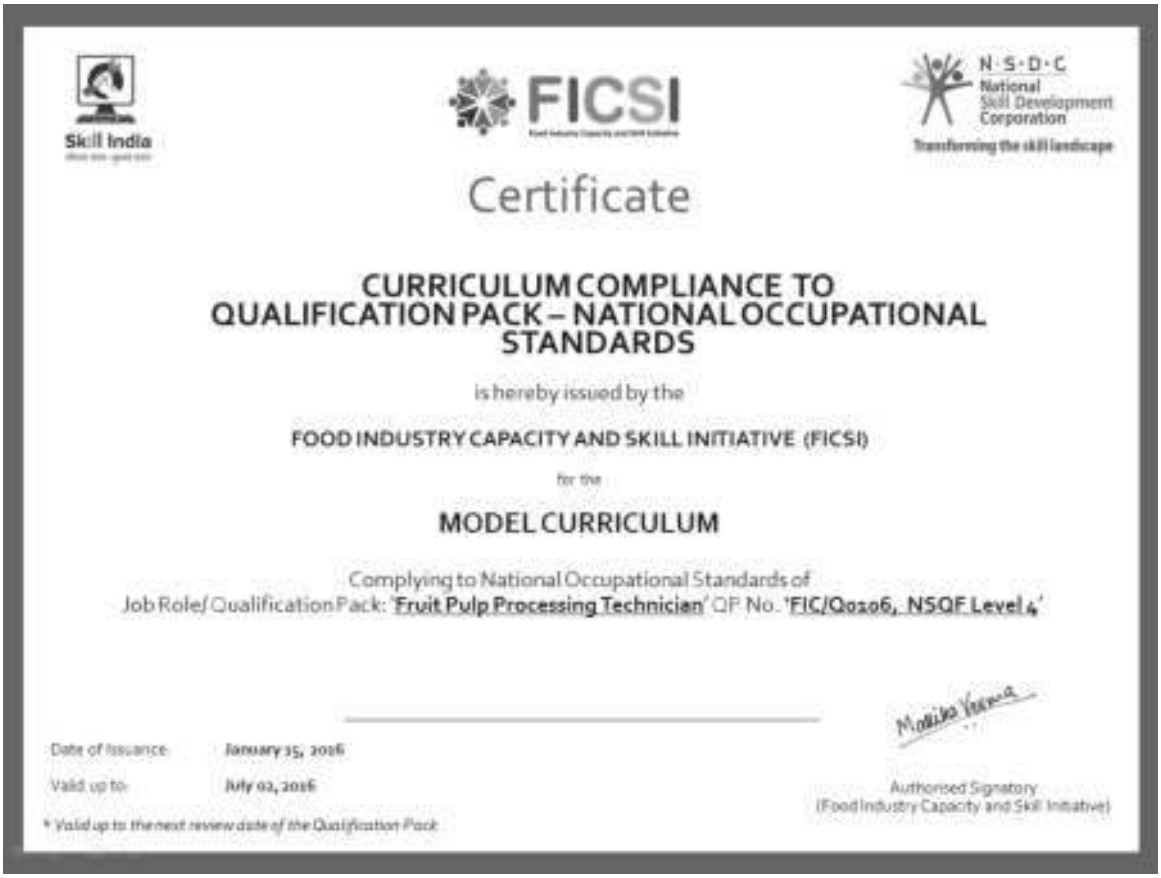
1.	Visit to industry to learn the management system	16
2.	Visit to Fruit & Vegetable Processing Industries. Preparation of a Business Plan for setting up fruit & vegetable processing unit	40
	TOTAL	**56**

VI	**Hands on Training in Fruit Pulp Processing Industry and submission of report**	120
	TOTAL	**540**

Model Curriculum

Fruit Pulp Processing Technician

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



Skill India

FICSI

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

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**'

Monika Verma

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

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

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

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

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: 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	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**	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**	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)	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	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	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)	• 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	• 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**	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	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
		• 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	• 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	• 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	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	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	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**	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**	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**	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	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**	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**	• 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**	• 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 canter 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 machinerie		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 though 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,startmachine, 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 codling 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

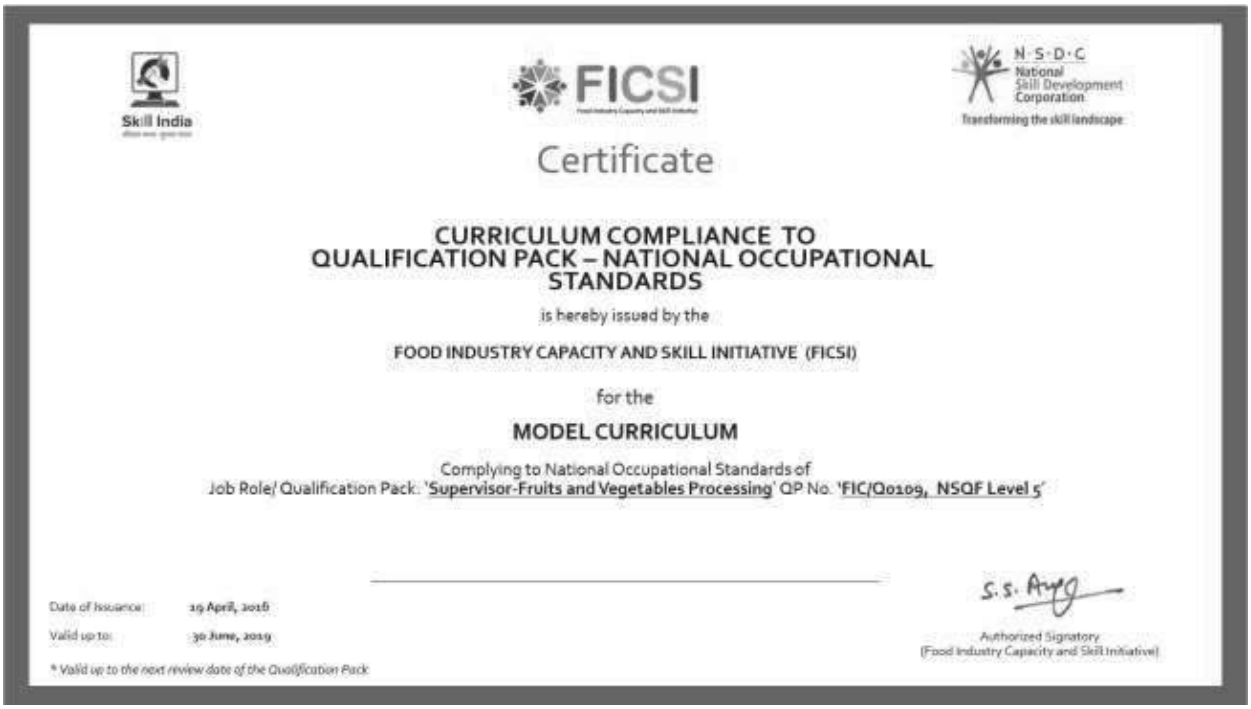
Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	Total		**100**	**60**	**40**
5. FIC/N9001: Food Safety, hygiene and sanitation for processing food products	PC1. Comply with food safety and hygiene procedures followed in the organization	**100**	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%**	

Model Curriculum

Supervisor-Fruits and Vegetables Processing

SECTOR: FOOD PROCESSING
SUB-SECTOR: FRUITS & VEGETABLES
OCCUPATION: PROCESSING
REF ID: FIC/Q0109, V1.0
NSQF LEVEL: 5



Skill India

FICSI

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

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: 'Supervisor-Fruits and Vegetables Processing' QP No. 'FIC/Q0109, NSQF Level 5'

Date of Issuance: 19 April, 2016
Valid up to: 30 June, 2019
* Valid up to the next review date of the Qualification Pack

S.S. Ayg

Authorized Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

Supervisor-Fruits and Vegetables Processing

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Supervisor-Fruits and Vegetables processing", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Supervisor-Fruits and Vegetables Processing**		
Qualification Pack Name & Reference ID. ID	FIC/Q0109, v1.0		
Version No.	1.0	**Version Update Date**	01/08/2018
Pre-requisites to Training	Preferably Class 12 and 2 years' experience in fruit and vegetable processing unit		
Training Outcomes	**After completing this programme, participants will be able to:** • ensure preparation of work area and process machineries for fruit & vegetable processing, • execute production planning of fruits & vegetable processing, • supervise and coordinate activities of workers engaged in production of fruits & vegetable products, • perform documentation and record keeping of raw material, ingredients and the finished good, • apply sanitation and hygiene practices in the work environment, • manage and lead the team.		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of "Supervisor-Fruits and Vegetables Processing" Qualification Pack issued by "Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to Training Program and Overview of Food Processing Industry** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• Define food processing • List the various sub sectors of food processing industry • Define fruits and vegetables Processing • List the various units within a fruits and vegetables processing industry • State the roles and responsibilities of supervisor-fruits and vegetables processing	
2	**Organizational Standards and Norms** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** Bridge Module	• State the roles and responsibilities of a Supervisor-fruits and vegetables processing • 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	Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
3	**Ensure Preparation and Maintenance of Work Area and Process Machineries for Production of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 20:00	• Check if the work area is cleaned using approved sanitizers • Describe the importance of cleanliness of the work area • Check if the work area is safe and hygienic for food production • Check the working and performance of all machineries and tools used for fruits and vegetables processing • Check if the equipment are washed with approved sanitizers • Check if the disposal of waste material is as per SOP	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code FIC/N0131		
4.	**Execute production planning of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** FIC/N0132	• Perform the grouping of ingredients for same type of products • Plan production sequence • Demonstrate the allotting of responsibilities • Perform calculation for raw material requirement • Perform a check on the availability of raw material, ingredients and packaging materials	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
5.	**Supervise Production of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 40:00 **Corresponding NOS Code** FIC/N0133	• Perform a check if all the machineries are clean and in good working conditions • Demonstrate assembling of all components of machines • Perform a pre check on all machineries • Review of the production order • Check if the production area is clean for processing of fruits and vegetables • Check the quality report of fruits and vegetables to ensure conformance to the industry standards • Demonstrate the monitoring of control panel of each fruits and vegetables processing machinery • Co-ordinate with the maintenance team and ensure machine breakdowns are attended • Check for timely production of the food product • Complete all the documents related to production and pass them on to manager • Demonstrate cleaning the machineries used with recommended sanitizers following CIP (clean-in-place) procedure • Demonstrate cleaning the equipment and tools used using recommended cleaning agents and sanitizers	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
6.	**Complete Documentation and Record Keeping**	• State the need for documenting and maintaining records of raw materials, processes and finished products • State the method of documenting and	Food Safety Manual, Log Books.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Related to Packaging Food Products **Theory Duration** (hh:mm) 06:00 **Practical Duration** (hh:mm) 05:00 **Corresponding NOS Code** FIC/N0134	recording the details of raw material to final finished product • Demonstrate the process of documenting records of production plan, process parameters, and finished products	
7.	**Food Safety, Hygiene and Sanitation for Packaging Food Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** FIC/N9001	• State the importance of safety, hygiene and sanitation in the baking industry • Apply the industry standards to maintain a safe and hygiene workplace • Apply HACCP principles to eliminate food safety hazards in the process and products • Apply safety practices in the work area	Protective Gloves, Head Caps, Aprons, Safety Goggles, Safety Boots, Mouth Covers, Sanitizer, Food Safety Manual ,Log Books etc.
8.	**Leadership Skills** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** FIC/N9004	• Perform a check if the team is aware about the schedule and expectations from them • Conduct regular meetings with the team members • Tell the team member to participate in various activities organized by the organization • Demonstrate counselling of team members • Conduct training of team members • Provide feedback to the team members	Computer/Laptop, Log Books
9.	**Professional and Core Skills** **Theory Duration** (hh:mm) 04:00	• Plan a general aptitude self-assessment test • Identify personal strengths and weaknesses • Plan and schedule the work order	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 10:00 **Corresponding NOS Code** Bridge Module	• Manage time effectively to complete the tasks assigned • Identify and resolve potential problems and take preventive measure to prevent it • State the importance of decision making • State the importance of listening	
10.	**IT Skills** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 15:00 **Corresponding NOS Code** Bridge Module	• 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	Computer/Laptop
	Total Duration **240:00** **Theory Duration** **75:00** **Practical Duration** **165:00**	**Unique Equipment Required**: Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual, Log Books, Computer/Laptop	

Grand Total Course Duration: **240Hours, 0 Minutes**
Recommend OJT Hours: **60Hours, 0 Minutes**

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

Trainer Prerequisites for Job role: "Supervisor- Fruits and Vegetables Processing" mapped to Qualification Pack: "FIC/Q0109, 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/Q0109", 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 Technology or Food Engineering with 2-3 years of hands on experience in a Fruits/Vegetables Unit • M.Sc/M.Tech/ME in Food Technology or Food Engineering with 1-2 years of hands on experience in a Fruits/Vegetables Unit
4a	**Domain Certification**	Certified for Job Role: "Supervisor-Fruits & Vegetables Processing" mapped to QP: "FIC/Q0109, 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: "MEP/Q0102". Minimum accepted score is 80 % as per FICSI guidelines.
5	**Experience**	• B.Sc/B.Tech/BE in Food Technology or Food Engineering with 2-3 years of hands on experience in a Fruits/Vegetables Unit • M.Sc/M.Tech/ME in Food Technology or Food Engineering with 1-2 years of hands on experience in a Fruits/Vegetables Unit

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Supervisor-Fruits and Vegetables Processing
Qualification Pack	FIC/Q0109, v1.0
Sector Skill Council	Food Processing

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. Assessment will be conducted for all compulsory NOS, as well as the selected elective NOS/set of NOS.
OR
4. Assessment will be conducted for all compulsory NOS, as well as the selected optional NOS/set of NOS.
5. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below)
6. Individual assessment agencies will create unique evaulations for skill practical for every student at each examination/training center based on this criteria
7. To pass the Qualification Pack , every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
8. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
1. FIC/N0131: Prepare and maintain work area and process machineries for production of fruits & vegetables	PC.1 ensure work area is cleaned using approved sanitizers and cleanliness is maintained to keep it free from dust, waste, flies and pests	**100**	15	5	10
	PC2. Ensure that the work area is safe and hygienic for food processing		20	8	12
	PC3. ensure disposal of waste materials as per defined SOPs and industry requirements		15	6	9
	PC4. ensure the working and performance of all machineries and tools used for production of fruits and vegetable products like washer, peeler, slicer, pulper, pasteurizer, drier,refractometer, salinometer, double jacketed kettle, juice extractor, clarifier, evaporator, retort, packaging machines etc.		20	8	12
	PC5. ensure machineries and tools are cleaned using recommended sanitizers following the SOP		10	4	6
	PC6. ensure tools required for process are placed accessible, to use when necessary		5	1	4
	PC7. ensure minor repairs/ faults of all machines are attended		15	3	12
			100	**35**	**65**
2. FIC/N0132: execute production planning of fruits & vegetable products	PC1. plan production sequence by • grouping products of same type (varieties of juices, pulps, jams, pickles etc) • using same equipment and machinery for various products such that one product does not impact the quality of the other • planning maximum capacity utilization of machineries • considering the process time for each product • planning efficient utilization of resources/manpower • prioritizing urgent orders		27	10	17
	PC2. calculate the batch size based on the production order and machine capacity		7	2	5
	PC3. calculate lead time for production of various products planned		11	3	8
	PC4. prepare shift schedule for assistants/technicians		5	2	3
	PC5. allot responsibilities work to the assistants/technicians and helpers		5	2	3
	PC6. calculate the raw material requirement		5	2	3

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	(considering the process loss) to produce finished product(s) as per production order				
	PC7. calculate the raw materials, packaging materials and manpower requirement for completing the order		5	2	3
	PC8. check the availability of raw materials, packaging materials, equipment and manpower		9	3	6
	PC9. prepare indent for issue of raw materials and packaging materials from store		3	1	2
	PC10. ensure transfer of raw materials and packaging materials from store production and packaging area through helpers		2	0.5	1.5
	PC11. ensure checking the weight of raw materials and packaging materials received from store and check its conformance of quality to organisation standards through physical parameters like appearance, colour, texture etc		8	2.5	5.5
	PC12. verify quality documents from supplier and internal lab to ensure its conformance to standards		9	4	5
	PC13. ensure raw materials (including ingredients, additives, preservatives etc) for the batch are weighed accurately following the formulations		4	2	2
			100	**35**	**65**
3. FIC/N0133: Supervise production of fruit and vegetable products	PC1. check and ensure cleanliness and sterilization of all fruit and vegetable processing machineries like washer, peeler, slicer, pulper, drier, juice extractor, juice clarifier, evaporator, retort, pasteurizer, steam jacketed kettle, packaging machines etc	**100**	2	0.5	1.5
	PC2.check and ensure maintenance has been carried out on all fruit and vegetable processing machineries and equipments		2	0.5	1.5
	PC3.check and ensure all process machineries are clean and in good mechanical condition		2	0.5	1.5
	PC4. check assembling of fittings like stirrer, blades, pipes and other parts to equipment and ensure all machineries are ready for production		5	0.5	4.5
	PC5. start each process machineries and ensure its working and performance and check if required tools are kept accessible to attend repairs/faults in case of breakdown		2	0.5	1.5

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC6. review production orders or schedules to ascertain product details such as type of products to be produced, quantities, specifications of products and scheduled delivery dates in order to plan production operation		2	1	1
	PC7. check and ensure production area is safe and clean		2	0	2
	PC8. verify the quality report on raw materials to ensure its conformance to quality standards		2	1	1
	PC9. monitor control panel of each fruit and vegetable processing machinery and ensure applicable process parameters like temperature, pressure, time etc (as applicable) are set in accordance with standards for production of various fruit and vegetable products		3	1	2
	PC10. observe control points and equipments at regular intervals to ensure operational performance and optimum utilization		3	1	2
	PC11. stop production following stop procedure, in case of machine breakdowns during production		3	1	2
	PC12. co-ordinate with maintenance team and ensure machine breakdowns are attended to immediately in order to prevent operational delays		3	1	2
	PC13. suggest control measures and corrective actions for any problems related to production, process and products, if required consult with manager and resolve problems		4	1.5	2.5
	PC14. ensure product quality by establishing and enforcing organization standards in each stage of production process		3	1	2
	PC15. monitor packaging of finished products, perform random check on weight of packed products, check label details like date of manufacture, batch number, expiry date etc and ensure products are packed as per organisation and regulatory standards		4	1.5	2.5
	PC16. monitor production activities, coordinate with cross function team and ensure production is started and completed as scheduled		4	1.5	2.5
	PC17. ensure timely production with minimum or no wastage, and quality of products		4	1.5	2.5

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	produced meets organisation and regulatory standards				
	PC18. analyze production performance records and data, investigate issues related to fruit and vegetable products processing, discuss with manger and identify solutions to prevent/correct problems, and ensure to implement suggested corrective action		4	1.5	2.5
	PC19. evaluate new equipment and techniques while producing new products and on installation of new machineries		4	2	2
	PC20. maintain safe and clean work environment by educating team on procedures to maintain compliance		3	1.5	1.5
	PC21. monitor activities and performance of assistants, technicians, operators and helpers		7	3	4
	PC22. provide production information to the manager by compiling, sorting, and analysing production performance records of all shifts		4	1.5	2.5
	PC23. update manager on day-to-day activities, discuss problem, suggest or understand suggested preventive and corrective action, and implement corrective actions immediately		4	1	3
	PC24. update manager on day-to-day activities, discuss problem, suggest or understand suggested preventive and corrective action, and implement corrective actions immediately		6	2	4
	PC25. monitor cleaning of work area, equipments and tools using recommended cleaning agents and sanitizers		8	3	5
	PC26. ensure minor repairs/faults (if any) of all components and machines are attended to before the start of next production		4	1	3
	PC27. ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the sop or following suppliers instructions/manuals		6	3	3
			100	**35**	**65**
4. FIC/N0134: Complete documentation	PC1. Document and maintain records of details of raw materials type and variety, grown area, grown season, quantity,	**100**	10	6	4

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
and record keeping related to production of fruit and vegetable products	vendor/supplier details, date of manufacture, expiry date, quality report from supplier and internal lab etc. as per organisation standards				
	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 such as product details, production sequence, equipments and machinery details, efficiency and capacity utilization of equipment		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 (if any) or deviations related to process and production		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

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	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
			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
	PC15.Label raw materials and finished products and store them in different storage areas according to safe food practices		5	2	3

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC16.Follow stock rotation based on FEFO/FIFO		10	4	6
			100	**35**	**65**
6. FIC/N9004 (Manage and lead a team)	PC1. ensure that the team is aware of the schedule and job expectations on a daily basis		12	4	8
	PC2. involve the team in regular meetings to communicate information intended for them		12	4	8
	PC3. ensure communication to the team on any changes in policies/ processes by the organization through required verbal/ written mechanisms		12	4	8
	PC4. ensure participation of the team in various engagement initiatives organized by the organization		8	2	6
	PC5. counsel and address issues among the team for any work related issues		12	4	8
	PC6. support the manager in deployment of the team as per production schedule and the organizational norms and guidelines		6	2	4
	PC7. ensure periodic training of the team and support the team by delivering trainings		6	3	3
	PC8. share knowledge of processes, techniques and products with the team to enhance their skill levels		6	3	4
	PC9. provide feedback to the manager pertaining to performance of the team		6	3	3
	PC10. motivate workers, initiate and develop cooperation within and between departments, develop personal growth opportunities		4	1	3
	PC11. maintain effective supervisor-worker relations, create safe work environment, establish effective communication methods, identify and solve employee problems, manage conflict, respond to grievances		4	2	2
	PC12. manage employees and team performance, provide new employee orientation, educate team on procedures to maintain compliance, train or provide adequate training and motivate employees		4	1	3
	PC13. coach, counsel and discipline employees, initiate, coordinate and enforce systems, policies and procedures through team		4	2	2
	PC14. evaluate, investigate complaints or performance concerns, implement		4	2	2

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	disciplinary action as needed in consultation with proper authorities				
			100	**35**	**65**

Model Curriculum

Food Regulatory Affairs Manager

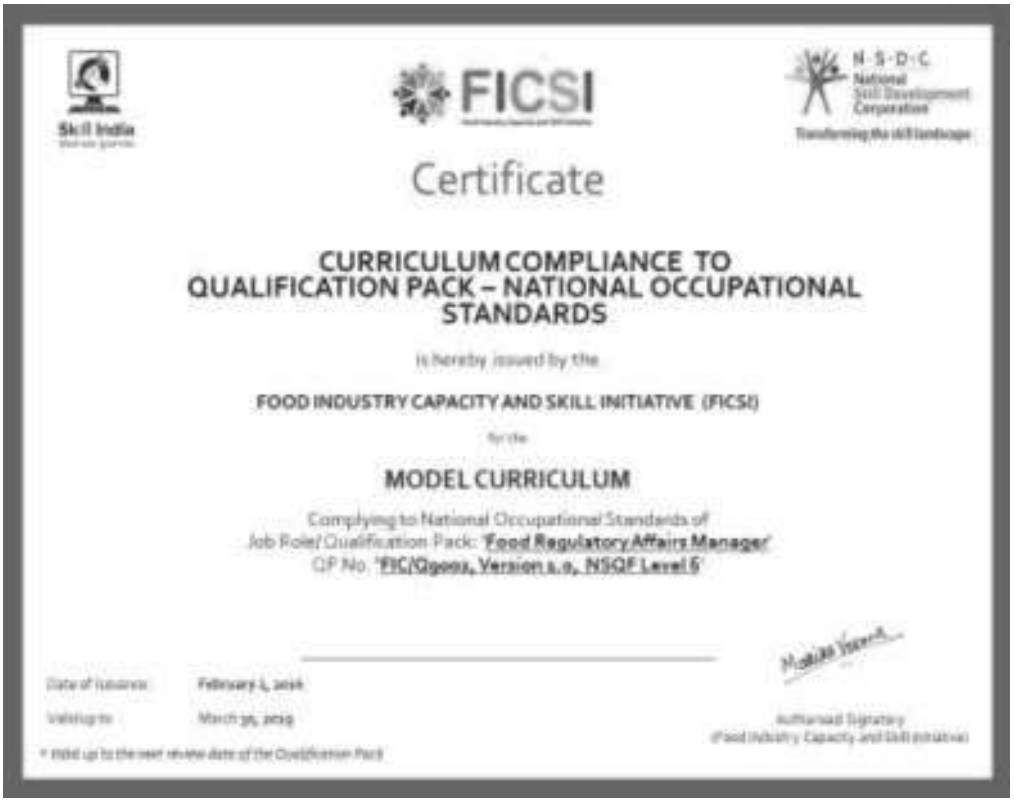
SECTOR: FOOD PROCESSING

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



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: 'Food Regulatory Affairs Manager'
QP No. 'FIC/Q9009, Version 1.0, NSQF Level 6'

Date of Issuance: February 1, 2016
Valid up to*: March 30, 2019

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

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

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 unitor 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 foos 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
		produced, processed, marketed, distributed and sold 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 Design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices 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 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 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 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 Evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes Evaluate promotional and materials for regulatory impact and provide approval Provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		Initiate and contribute to process improvements which have an impact on regulatory affairs, quality assurance and other departments Conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation Conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards 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 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 Monitor company progress toward fulfillment of regulatory commitments 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 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 Provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		and handling them with technical and scientific approach 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 Provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them	
6	**Manage change in food regulatory system** **Theory Duration** (hh:mm) 14:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** FIC/N9012	• 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
		implementing and following the change, to management and concerned employees • 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 thorough 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 thorough new policies and procedures	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• 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	**Prepare representations to regulatory authorities and for new product registrations** **Theory Duration** (hh:mm) 09:00 **Practical Duration** (hh:mm) 14:00 **Corresponding NOS Code** FIC/N9013	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 Review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments Prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation Coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals Prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity Interface with consultants, research organizations, partners, co-manufacturers etc. for preparation, review, compilation, finalization and submission of documents for regulatory approvals Prepare responses to communications and other requests from government food regulatory authorities 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 Identify reasons related to non-compliance of food products to regulatory standards, collect relevant information's and data,	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, audit documents, regulatory policies

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		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 Interact with various regulatory authorities during concept, development and industrialization stages of projects for clarification and approvals Interact with the notified bodies and competent authorities for developing and reviewing regulatory standards Coordinate with regulatory authorities for reporting, to comment on proposed regulations, and to represent company's interest in the development of standards and guidelines 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 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 Participate in seminar, workshops, conferences and meetings organised by FSSAI and other industry association, representing the organisation to maintain, strengthen and expand contacts 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	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		organisation and to manage them proactively Develop and write clear arguments and explanations for new product license Prepare and present registration documents to regulatory authorities and notified bodies for new product approvals Present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing Evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome Prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval Provide regulatory and product compliance report in the area of advertising and label claims for new products	
8	**Field Visits** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code**	Observe the 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
9	**Revision** **Theory Duration** (hh:mm) 01:00	Revised the knowledge gained so far	Allthe 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: "Food regulatory affairs Manager" mapped to QP: "FIC/Q9002, 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**	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 canter 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 thorough 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 thorough 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

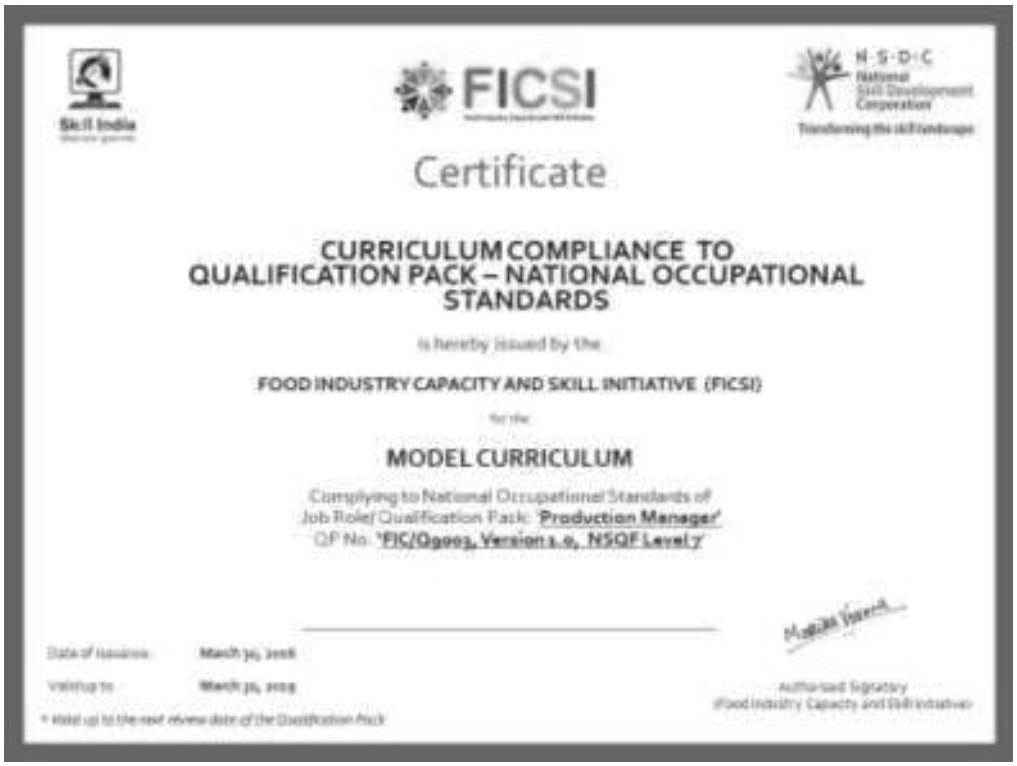
Production Manager

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



Skill India

FICSI

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

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/Q9003, Version 1.0, NSQF Level 7'**

Date of Issuance: March 30, 2018
Valid up to*: March 30, 2019
* Valid up to the next review date of the Qualification Pack

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

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	**After completing this programme, participants will be able to:** 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	• 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
		plan discussed with plant manager (or) customer requirement (as applicable) and identify production priorities to meet market requirement • 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
		performance and arrive at production capability of each process equipment • 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
		to control cost and to achieve better yield and quality • 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	**Manage production optimization and cost efficiency** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 12:00 **Corresponding NOS Code** FIC/N9015	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 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 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 Calculate utilities and energy usage in production area and for production process, identify methods to minimize usage Develop plans and procedures to minimize use of utilities and energy without affecting the production efficiency 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 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 Analyze usage pattern of energy and other utilities in production area and process against budget allocation, identify cost effective options for	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook ,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		minimizing wastage, and implement changes 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 Communicate with relevant authorities/superiors the need for change, results and benefits expected our of change 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 Provide training and support to implement changes, develop a strategy to help teams implement change Monitor changes implemented in production process and ensure changes are effective and meet the organisation and regulatory requirements Document and communicate the progress achieved through implemented change to the management and everyone involved, and make them understand and enjoy achievement Recognize and reward employees and teams for implementing change in production system and achieving better efficiency Manage budget efficiently by managing production with available resource, by avoiding overtime and too many casual workers/helpers 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 Identify situations where actual budget exceeds the approved budget, investigate reason for variance and take appropriate	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		corrective action to keep budget under control 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 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 Encourage team to think and identify ways of reducing expenditure, analyse and pursue the suggested ideas	
8	**Manage documentation system and implement safety and environmental policies** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 09:00 **Corresponding NOS Code** FIC/N9016	• 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
		• 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: "Production Manager" mapped to QP: "FIC/Q9003, 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**	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 canter 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 our 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-todate 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, andprovide 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%**	

Production Manager