

**THE GANDHIGRAM RURAL INSTITUTE - DEEMED TO BE UNIVERSITY**  
**MINISTRY OF EDUCATION (SHIKSHA MANTRALAYA), GOI**  
**ACCREDITED BY NAAC WITH 'A' GRADE (3rd Cycle) GANDHIGRAM - 624302,**  
**DINDIGUL DISTRICT, TAMIL NADU**



**B.VOC FOOD PROCESSING SYLLABUS**  
**(With effect from September 2021)**  
**DDU – KAUSHAL KENDRA GANDHIGRAM -624302**

## Scheme of syllabus for DDU-KK- UGC B.Voc. Food Processing Degree Programme

## Semester I

Category	Course Code	Title of The Course	Theory	Practical	Credits	Marks Distribution		
						CFA	ESE	Total
General components (A)	21ENGU01F1	Foundational English I	3	-	3	40	60	100
		Yoga	-	1	1	50	-	50
	21FPRV0101	Food Commodities	4	-	4	40	60	100
	21FPRV0102	Environmental science	4	-	4	40	60	100
	<b>Total =</b>		<b>11</b>	<b>01</b>	<b>12</b>	<b>170</b>	<b>180</b>	<b>350</b>
Skill components (B)	21FPRV0103	Fundamentals of Food and Nutrition (P)	-	5	5	60	40	100
	21FPRV0104	Food Chemistry (T)	2	-	2	50	-	50
	21FPRV0105	Food Chemistry(P)	-	3	3	60	40	100
	21FPRV0106	Cereals, Pulses & Oilseeds Processing	3	-	3	40	60	100
	21FPRV0107	Cereals, Pulses & Oilseeds Processing (P)	-	3	3	60	40	100
	21FPRV0108	Internship	-	2	2	50	-	50
	<b>Total =</b>		<b>05</b>	<b>13</b>	<b>18</b>	<b>320</b>	<b>180</b>	<b>500</b>
	<b>Grand Total (A+B)</b>				<b>12+18=30</b>	<b>490</b>	<b>360</b>	<b>850</b>

NSQF level 4

Pulse Processing Technician FIC/Q1004

Semester II

Category	Course Code	Title of The Course	Theory	Practical	Credit	Marks Distribution			
						CFA	ESE	Total	
	21ENGU02F2	Foundational English II	3		3	40	60	100	NSQF Level 5
	21CSAV0201		-	4	4	60	40	100	
<b>General Components (A)</b>	21FPRV0209	Unit operations in food processing (P)	-	5	5	60	40	100	
	<b>Total =</b>		<b>03</b>	<b>09</b>	<b>12</b>	<b>160</b>	<b>140</b>	<b>300</b>	<b>Plant Baker FIC/Q5001</b>
<b>Skill Components (B)</b>	21FPRV0210	Grain Milling Technology	3	-	3	40	60	100	
	21FPRV0211	Grain Milling Technology (P)	-	3	3	60	40	100	
	21FPRV0212	Bakery and Confectionary Products	3	-	3	40	60	100	
	21FPRV0213	Bakery and Confectionary Products (P)	-	3	3	60	40	100	
	21FPRV0214	Technology for convenience foods (P)	-	4	4	60	40	100	
	21FPRV0215	Internship		2	2	50	-	50	
	<b>Total =</b>		<b>06</b>	<b>12</b>	<b>18</b>	<b>310</b>	<b>240</b>	<b>550</b>	
		<b>Grand Total (A+B) =</b>			<b>12+18=30</b>	<b>470</b>	<b>380</b>	<b>850</b>	

## Semester III

Category	Course Code	Title of The Course	Theory	Practical	Credits	Marks Distribution		
						CFA	ES E	Total
<b>General Component (A)</b>	<b>21FPRV0316</b>	Food Quality Evaluation (P)	-	3	3	60	40	100
	<b>21FPRV0317</b>	Personality Development	3	-	3	40	60	100
	<b>21FPRV0318</b>	Food Preservation-Principle & Practices	3	-	3	40	60	100
	<b>21FPRV0319</b>	Food Preservation-Principle & Practices(P)	-	3	3	60	40	100
	<b>Total =</b>			<b>06</b>	<b>06</b>	<b>12</b>	<b>200</b>	<b>200</b>
<b>Skill Component (B)</b>	<b>21FPRV0320</b>	Dairy Processing (T)	5	-	5	40	60	100
	<b>21FPRV0321</b>	Food Laboratory and Safety Practices	3	-	3	40	60	100
	<b>21FPRV0322</b>	Food Laboratory and Safety Practices (P)	-	3	3	60	40	100
	<b>21FPRV0323</b>	Food Packaging (T)	3	-	3	40	60	100
	<b>21FPRV0324</b>	Processing of sugar, salt, and jaggery	2	-	2	50	-	50
	<b>21FPRV0325</b>	Internship	-	2	2	50	-	50
	<b>Total =</b>			<b>13</b>	<b>05</b>	<b>18</b>	<b>280</b>	<b>220</b>
<b>Grand Total (A+B) =</b>					<b>12+18 = 30</b>	<b>480</b>	<b>420</b>	<b>900</b>

## Semester IV

Category	Course Code	Title of The Course	Theory	Practical	Credits	Marks Distribution			
						CF A	ESE	Total	
General Component (A)	21CSAV0402		-	4	4	60	40	100	NSQF Level 6 Quality Assurance Manager (FIC/Q7602)
	21GSPSU001	Gandhi's Life Thought and Work	2	-	2	20	30	50	
	21FPRV046	Milk product technology	3	-	3	40	60	100	
	21FPRV047	Milk product technology (P)	-	3	3	60	40	100	
	<b>Total =</b>			<b>08</b>	<b>04</b>	<b>12</b>	<b>180</b>	<b>170</b>	
Skill Component (B)	21FPRV048	Food Analysis and Quality Testing	4	-	4	40	60	100	
	21FPRV049	Food Analysis and Quality Testing (P)	-	4	4	60	40	100	
	21FPRV0430	Food Microbiology (T)	2	-	2	50	-	50	
	21FPRV0431	Food Microbiology (P)	-	3	3	60	40	100	
	21FPRV0432	Food Quality Assurance	3	-	3	40	60	100	
	21FPRV0433	Internship	-	2	2	50	-	50	
	<b>Total =</b>			<b>09</b>	<b>09</b>	<b>18</b>	<b>300</b>	<b>200</b>	<b>500</b>
<b>Grand Total (A+B)</b>					<b>12+18 = 30</b>	<b>480</b>	<b>370</b>	<b>850</b>	

## Semester V

Category	Course Code	Title of The Course	Theory	Practical	Credit	Marks Distribution		
						CFA	ES E	Total
General Component (A)	21FPRV0534	Food Business Management	3	-	3	40	60	100
	21FPRV0535	Entrepreneurship Development	3	-	3	40	60	100
	21FPRV0536	Computer applications in food Industry (P)	-	3	3	60	40	100
	21FPRV0537	Postharvest technology of fruits and vegetables (P)	-	3	3	60	40	100
	<b>Total =</b>			<b>06</b>	<b>06</b>	<b>12</b>	<b>200</b>	<b>200</b>
Skill Component (B)	21FPRV0538	Fruits and Vegetables Processing	3	-	3	40	60	100
	21FPRV0539	Fruits and Vegetables Processing (P)	-	4	4	60	40	100
	21FPRV0540	Drying Technology (P)	-	3	3	60	40	100
	21FPRV0541	Novel Food Processing Technologies	3	-	3	40	60	100
	21FPRV05E1 / E2/E3	Elective	3	-	3	40	60	100
	21FPRV0542	Internship		2	2	50	-	50
	<b>Total =</b>			<b>09</b>	<b>09</b>	<b>18</b>	<b>290</b>	<b>260</b>
<b>Grand Total (A+B) =</b>					<b>12+18 = 30</b>	<b>490</b>	<b>460</b>	<b>950</b>

## Semester VI

Category	Course Code	Title of The Course	Theory	Practical	Credits	Marks Distribution				
						CFA	ESE	Total		
<b>General Component (A)</b>	<b>21FPRV0643</b>	Food Hygiene and Safety	3	-	3	40	60	100	<b>NSQF Level 7 Production Manager FIC/Q9003</b>	
	<b>21FPRV0644</b>	Food Plant Maintenance and Management	4	-	4	40	60	100		
	<b>21FPRV0645</b>	Project Preparation and Management	4	-	4	40	60	100		
	<b>21FPRV0646</b>	Online Swayam portal	1	-	1	-	-	-		
	<b>Total =</b>			<b>12</b>	<b>-</b>	<b>12</b>	<b>120</b>	<b>180</b>		<b>300</b>
	<b>21FPRV0647</b>	Food product development	2	-	2	50	-	50		
	<b>21FPRV0648</b>	Project work	-	14	14	100	75+25=100	200		
	<b>21FPRV0649</b>	Internship	-	2	2	50	-	50		
<b>Total =</b>			<b>02</b>	<b>16</b>	<b>18</b>	<b>200</b>	<b>100</b>	<b>300</b>		
<b>Grand Total (A+B)</b>					<b>12+18 = 30</b>	<b>320</b>	<b>280</b>	<b>600</b>		

## ELECTIVES

SL.No.	Course code	Course Title	Credits
1.	<b>21FPRV05E1</b>	Functional foods and Nutraceuticals	3
2.	<b>21FPRV05E2</b>	Technology of sea food processing	3
3.	<b>21FPRV05E3</b>	Food Engineering	3

Total credits:

General components (A) =  $12+12+12+12+12+12 = 72$

Skill components (B) =  $18+18+18+18+18+18 = 108$

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**TOTAL** = 180  
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**FIRST SEMESTER**

**FOUNDATIONAL ENGLISH I**

**Code: 21ENGU01F1**

**Credit: 3+0**

**Contact Hours/Week: 3**

**Marks:100**

GRU-BVOC

## FOOD COMMODITIES

**Code:21FPRV0101**

**Credit: 4**

**Contact Hours/Week:4**

**Marks:100**

### **Course Objectives:**

- To know about the commodities derived from plants and animals
- To provide knowledge on nutritive value of food commodities
- To illustrate the importance of processing the food commodities

### **Specific Learning Outcome:**

After completion of this course, the students will be able to

- Identify the foods from plant and animal sources
- Select foods rich in nutrients for preparation of novel foods
- Categorize the foods based on its shelf life

### **UNIT I Science of Food**

Food meaning and its function, food composition, food groups, food production around the world and India, Food demand and supply, food wastage.

### **UNIT II Food Commodities- Plant foods I**

Cereals: rice, wheat, maize, barley oats & rye nutritive value, nutritive value of millets: sorghum, cumbu, ragi, theni etc., pulses and legumes types and nutritive value.

### **UNIT III Food Commodities- Plant Foods II**

Classification of vegetables-leaf, roots & tubers and others, nutritive value of vegetables, Classification of fruits-climatic& non-climatic, nutritive value of fruits.

### **UNIT IV Food Commodities – Animal Foods**

Milk: source, type and nutritive value, egg: source, type and nutritive value, meat and fish: sources, types and its nutritive value.

### **UNIT V Food Commodities – miscellaneous Foods**

Spices: source, type and nutritive value, sugar: source, type and nutritive value, fat and oil: source, type and nutritive value.

## **RELATED EXPERIENCES**

1. Plot a food pyramid using locally available food ingredients
2. Survey the availability of cereals in the market
3. Collect and display pulses and legumes
4. Identify the greens cultivated in the local area
5. Collect fruits available in the local market and categorize it
6. Survey on type of meat and fishes available in the market
7. Survey on spices and herbs cultivated in local area
8. Survey on types of sugar and evaluate its quality
9. Survey on vegetable oil and/fat available in the market
10. Visit to grain market
11. Visit to fruits and vegetable market
12. Visit to spice processing unit
13. Visit to dairy industry
14. Visit to oil mill
15. Visit to sugar unit

## **TEXTBOOK**

1. Srilakshmi, B.(2003), “Food Science”, New Age International Publishers, New Delhi
2. Potter, N.M. and Birch, G.G. (1986). Food Science, AVI, West Port, Conn.
3. Swaminathan, M. (1988). Food Science and Experimental Foods. Madras: Ganesh and Company.

## **REFERENCE BOOK**

1. Francis FJ. 2000. Wiley Encyclopedia of Food Science & Technology. John Wiley & Sons.
2. Manay, N.S. Shadaksharaswamy, M. (2004), “Foods- Facts and Principles”, New age international publishers, New Delhi.
3. Gopalan, C., Rama Sastri, B.V., Balasubramanian, S.C., Narasinga Rao, B.S., Deosthale, Y.G., & Pant, K.C. 2012. Nutritive value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India.

## **WEBOGRAPHY**

1. <https://egyankosh.ac.in/bitstream/123456789/11694/1/Unit-1.pdf>
2. [http://lib.rudn.ru/file/Food\\_Science\\_Nutrition\\_Catalogue\\_ebook.pdf](http://lib.rudn.ru/file/Food_Science_Nutrition_Catalogue_ebook.pdf)
3. <https://www.slideshare.net/RoshinaRabail/introduction-to-food-science-and-technology-101>
4. <https://www.slideshare.net/partharoychaudhry/cereals-pulses-36867856>
5. <https://slideplayer.com/slide/14016092/>
6. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147675>

## ENVIRONMENTAL SCIENCE

Code: 21FPRV0102

Credits: 4 Hours/week: 4

Marks: 100

### Course Objectives:

- To impart the knowledge on environmental and natural resources.
- To study about the impact of pollution, social issues and disaster management.
- To obtain the brief knowledge on Eco system and its functions.

### Specific Learning Outcome:

After learning this paper the students will gain knowledge in solid waste, waste water and disaster management and prevention techniques of deposition of hazardous materials on land.

#### UNIT I

Introduction - environmental ethics-assessment of socio - economic impact-environment audit-mitigation of adverse impact on environment - importance of pollution control-types of industries and industrial pollution.

#### UNIT II

Solid waste management-characteristics of industrial waste-methods of collection, transfer and disposal of solid wastes-converting waste to energy-hazardous waste management treatment technologies.

#### UNIT III

Waste water management-characteristics of industrial effluents-treatment and disposal methods-pollution of water sources and effects on human health.

#### UNIT IV

Air pollution management- sources and effects-dispersion of air pollutants-air pollution control methods-air quality management; noise pollution management-effects of noise on people, noise control methods.

#### UNIT V

Disaster management-meaning, concepts, causes and types, effects of disaster on community economy and environment, disaster management cycle, response rehabilitation, reconstruction, role of community in disaster.

### **TEXT BOOKS**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email: mapin@icenet. net (R).

### **REFERENCE BOOKS**

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
2. Clerk B.S., Marine Pollution, ClandersonPross Oxford (TB).

### **WEBOGRAPHY**

1. <https://vardhaman.org/wp-content/uploads/2019/10/ENVIRONMENTAL-SCIENCE-1.pdf>
2. <https://elaw.org/system/files/Chapter%208%20Disaster%20Management.pdf>
3. [https://ec.europa.eu/echo/files/evaluation/watsan2005/annex\\_files/WEDC/es/ES07CD.pdf](https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/es/ES07CD.pdf)
4. <http://rcueslucknow.org/publication/TrainingModules/Dr.A.K.Singh/HandBookDisasterManagement.pdf>
5. <https://www.iloencyclopaedia.org/part-vii-86401/environmental-pollution-control/item/507-air-pollution-management>

## FUNDAMENTALS OF FOOD AND NUTRITION

Code: 21FPRV0103

Credit: 5

Contact Hours/Week:5

Marks:100

### Course Objectives:

- To know about the food types and its origin
- To understand the science behind food preparations
- To signify the role of food in health and well being

### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Relate food, nutrients and health
- Choose appropriate cooking method for food preparation
- Suggest method to reduce loss of nutrients during processing.

### UNIT I Introduction to food

Classification of foods based on the origin, food concepts: healthy foods, ethnic foods, organic foods, functional foods, nutraceuticals, fabricated foods, extruded foods, convenience foods, junk foods, GM foods.

### UNIT II Food preparations

Basic operations like cleaning, peeling, cutting, blanching etc advantages and limitations, cooking meaning, objectives of various cooking methods: wet and dry advantages and limitations, use of microwave and solar cooker

### UNIT III Human nutrition

Nutrition definition, macronutrients: carbohydrates, proteins, lipids and role of water, requirement and deficiencies

### UNIT IV Human nutrition

Introduction to Micronutrients: Vitamins & minerals - functions, requirements and deficiencies

### UNIT V Energy balance

Energy meaning, unit of measurement, energy balance and energy components.

## **Practical**

1. Survey on types of food products available in the market
2. Collection of data on type of convenience foods sold in the market
3. Exercise on blanching of vegetables and fruits
4. Experiments on different types of cooking methods
5. Qualitative test for carbohydrate, protein and lipid present in food
6. Group the food ingredients based on carbohydrate, protein and lipid content
7. Group the foods based on vitamin content
8. Group the food ingredients based on mineral content
9. Calculate energy value of foods
10. Compute energy requirement of an individual

## **TEXTBOOK**

1. Srilakshmi, B. (1997). Food Science. New Delhi: Chennai: New Age International Private Limited. Publishers.
2. Mudambi, R.S. and Rajagopal, M.Y. (1991). Fundamentals of Food and Nutrition. New Delhi: Wiley Eastern Limited.
3. Swaminathan, M. (1988). Food Science and Experimental Foods. Madras: Ganesh and Company.
4. Bennion, et.al. (1985). Introductory Foods. New York: Macmillan.

## **REFERENCE BOOK**

1. Janet D. Ward. & Larry Ward (2015). Principles of Food Science, 4<sup>th</sup>ed. GoodheartWillcox Company Inc.
2. Srilakshmi, B. (2008). Nutrition Science. New Age International Publishers, New Delhi.
3. Potter, N.N. and Hotchkiss, J.H. (1996). Food Science, edition 5, CBS Publishers and Distributors, New Delhi.

## **WEBOGRAPHY**

1. [https://www.brainkart.com/article/Classification-of-Food\\_37944/](https://www.brainkart.com/article/Classification-of-Food_37944/)
2. <https://www.bngkolkata.com/pre-preparation-of-food/>
3. <https://www.britannica.com/science/human-nutrition>

## FOOD CHEMISTRY (T)

Code:21FPRV0104

Credit: 2

Contact Hours/Week:2

Marks:50

### Course Objectives:

- To provide knowledge on food constituents and its physical and chemical properties
- To understand the changes in food quality due to processing conditions

### Specific Objectives of Learning:

After completing this course students will be able to describe the general chemical structure of major components of foods (water, carbohydrates, protein and lipids) explain how changes in overall composition are likely to change the reactivity of food components. predict how processing conditions are likely to change the reactivity of food components.

### UNIT I Food Composition and Water

Introduction to food chemistry, food composition – water, carbohydrate, protein, fat, pigment, colours, flavours etc. Water: Structure, hydrogen bonding, effect of hydrogen bonding on the properties of water, moisture content of foods, free water, bound water, water activity.

### UNIT II Carbohydrates

Nomenclature, composition, structure, classification - monosaccharide, disaccharides, oligosaccharides and polysaccharides, properties and food sources. Starch – composition, structure and properties, concept of gelatinisation, dextrinisation, retrogradation.

### UNIT III Amino Acids & Proteins

Nomenclature, composition, structure, classification, properties of amino acids. Proteins: structure, classification, properties (physiochemical and functional) changes in proteins during processing.

### UNIT IV Fats and oils

Nomenclature, composition, structure, classification, physical and chemical properties - hydrolysis, hydrogenation, rancidity and flavour reversion, emulsion and emulsifiers, saponification value, acid value and iodine value, smoke point.

### UNIT V Enzymes, pigments, flavours in food

Enzymes – meaning and importance, classification, factors influencing enzymatic activity, quality changes due to enzyme action, enzymatic browning and method of control, enzymes added to food during processing. Pigments meaning, classification, properties, effect of processing and storage, flavours-composition, properties, effect of processing on flavour components.



## FOOD CHEMISTRY (P)

Code:21FPRV0105

Credit: 3

Contact Hours/Week:3

Marks:100

### Course Objectives

- To impart the knowledge about the changes happen in the constituents of food while cooking
- To know the properties of food quality both pre and post processing

### Practical

1. Determination of moisture content of different foods
2. Estimation of aW of foods
3. Examination the starch structure by microscope
4. Demonstrate the changes in starch properties due to heat, acid, alkali and alcohol
5. Analyze the functional properties of proteins
6. Study the physiochemical properties of proteins
7. Estimation of acid value of oil/fat
8. Determination of peroxide value of various oil
9. Exercise the methods used to prevent enzymatic browning
10. Study the effect of heat, acid, alkali on fruit/vegetable pigments

### TEXTBOOK

1. Meyer, L.H. (2002), "Food Chemistry". CBS publishers and Distributors, New Delhi.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
3. Seema Yadav, (1997). Food Chemistry, Anmol Publications Pvt.Ltd., New Delhi.

### REFERENCE BOOK

1. Damodaran, S., Parkin, K L., Fennema, O R., (2008), "Fennema's Food Chemistry"- 4th edition, CRC press, New York.
2. Yildiz, Fatih (2009), "Advances in Food Biochemistry", CRC Press, New York.

## WEBOGRAPHY

1. <https://www.slideshare.net/mobile/anjalikotwal1/a-nalysis-of-fat-and-oil>
2. <https://www.slideshare.net/mobile/sanjaijosephManesh/food-chemistry-51688453>
3. <https://people.umass.edu/~mcclemen/581Introduction.html>
4. <https://www.slideshare.net/mobile/MuhammadNaveedLaskan/food-and-water-food-chemistry-constituent-of-foods-ie-water-carbohyfrate-lipid-protein-vitamin-inorganic-material-other-substances-physical-property-of-water>
5. <https://www.slideshare.net/mobile/iska84anne/starch>
6. [https://www.uswatersystems.com/deionized-water-vs-distilled-water#:~:text=Deionized%20\(DI\)%20water%20is%20water,condensed%2C%20leaving%20most%20impurities%20behind.](https://www.uswatersystems.com/deionized-water-vs-distilled-water#:~:text=Deionized%20(DI)%20water%20is%20water,condensed%2C%20leaving%20most%20impurities%20behind.)
7. <https://www.slideshare.net/mobile/MsKPetty/protein-30986641>
8. <https://www.slideshare.net/mobile/SaifulIslam750/carbohydrates-and-its-classification>
9. <https://www.slideshare.net/mobile/MohamedHassanien/food-proteins>

## **CEREALS, PULSES AND OILSEEDS PROCESSING**

**Code:21FPRV0106**

**Credit: 3+0**

**Contact Hours/Week:3**

**Marks:100**

### **Course Objectives:**

- To create awareness about the processing of cereals, pulses and oilseeds.
- To study the storage and handling practices of cereals, oilseed and pulses.
- To gain knowledge on processing and milling of cereal, pulses and oilseeds.

### **Specific Objectives of Learning**

After completing this course students will be able to

- know about the post harvest technologies for cereals, pulses and oilseeds
- explain the loss of nutrients due to various processing methods adopted for cereals, pulses and oilseeds
- familiar with the process and production of value added products from cereals, pulses and oilseeds.

### **UNIT I Major Cereals Processing**

Post harvest technologies for major cereals, parboiling and milling of major cereals, processed products; effect of processing on nutritive value.

### **UNIT II Minor Cereals (Millet) Processing**

Post harvest technologies for millets, Processing and value addition of millets, effect of processing on nutritive value of millets.

### **UNIT III Pulses Processing**

Post harvest technologies for pulses; milling of pulses; antinutritional factors in pulses and the methods used for destruction/elimination; processed pulse products; effect of processing on nutritive value of pulses.

### **UNIT IV Nuts Processing**

Composition and nutritive value of nuts; post harvest technologies for nuts; processing of nuts, processed pulse products; effect of processing on nutritive value of nuts.

### **UNIT V Oilseeds Processing**

Structure, composition and nutritive value of oilseeds; oil extraction methods and refining process; effect of processing on nutritive value, oil quality changes during storage: rancidity and the types; rancidity prevention methods.

## TEXTBOOK

1. Chakraverty, A. (1995), "Post Harvest Technology of Cereals, Pulses and Oilseeds". Oxford and IBH Publishing Co, Calcutta.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.

## REFERENCE BOOK

1. N.L.Kent and A.D.Evans. (1994) "Technology of Cereals" (4th Edition), Elsevier Science (Pergaman), Oxford, UK,
2. Samuel Matz. (1992), "The Chemistry and Technology of Cereals as Food and Feed, Chapman & Hall.
3. Dendy DAV and Dobraszczyk BJ. (2001), "Cereal and Cereal Products", Aspen Publications.

## WEBOGRAPHY

1. [https://www.brainkart.com/article/Processing-of-cereals\\_33958/](https://www.brainkart.com/article/Processing-of-cereals_33958/)
2. <https://cftri.res.in/Milletts/>
3. <https://www.slideshare.net/Senthil13k/wheat-42967958>
4. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5911>
5. <https://www.cooksinfo.com/flour-grades>
6. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5913>
7. <https://www.slideshare.net/LinaDarokar/milling-process-rice-dal>
8. <https://www.slideshare.net/tusharbhar96/parboiling-of-rice>
9. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5933>
10. <https://www.slideshare.net/tusharbhar96/parboiling-of-rice>
11. <https://www.slideshare.net/mobile/mahmudulmithun/postharvest-technology-of-agricultural-product>
12. <http://www.fao.org/3/ac301e/ac301e03.htm>
13. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=805>
14. <https://www.cashews.org/en/cashew-processing>

## CEREALS, PULSES AND OILSEEDS PROCESSING PRACTICAL

Code:21FPRV0107

Credit: 0+3

Contact Hours/Week:3

Marks:100

### Course Objectives:

- To create awareness about the processing of cereals, pulses and oilseeds.
- To study the storage and handling practices of cereals, oilseed and pulses.
- To gain knowledge on processing and milling of cereal, pulses and oilseeds.

### Specific Objectives of Learning

After completing this course students will be able to

- know about the post harvest technologies for cereals, pulses and oilseeds
- explain the loss of nutrients due to various processing methods adopted for cereals, pulses and oilseeds
- familiar with the process and production of value added products from cereals, pulses and oilseeds.

### Practical

1. Demonstrate parboiling of paddy
2. Determine the quality of raw and parboiled rice
3. Preparation of millet based food products
4. Determine the physiochemical and functional properties of millet flours
5. Preparation of pulse based food products
6. Exercise on methods for destruction of antinutritional factors in pulses
7. Determine functional properties of nuts
8. Preparation of nuts incorporated food products
9. Determine the quality of vegetable oils
10. Chemical tests for determination of rancidity
11. Visit to rice processing industry
12. Visit to millet processing unit
13. Visit to pulse processing industry
14. Visit to nuts processing unit
15. Visit to oil extraction and refining industry

### TEXTBOOK

1. Chakraverty, A. (1995), "Post Harvest Technology of Cereals, Pulses and Oilseeds". Oxford and IBH Publishing Co, Calcutta.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.

## REFERENCE BOOK

1. N.L.Kent and A.D.Evans. (1994) “Technology of Cereals” (4th Edition), Elsevier Science (Pergaman), Oxford, UK,
2. Samuel Matz. (1992), “The Chemistry and Technology of Cereals as Food and Feed, Chapman & Hall.
3. Dendy DAV & Dobraszczyk BJ. (2001), “Cereal and Cereal Products”, Aspen Publications.

## WEBOGRAPHY

1. <https://www.fda.gov/food/laboratory-methods-food/mpm-v-10-nuts-and-nut-products-methods>
2. <https://youtu.be/kVqisXuiWsc>
3. [https://www.millets.res.in/technologies/Technologies\\_of\\_millet\\_value\\_added\\_products.pdf](https://www.millets.res.in/technologies/Technologies_of_millet_value_added_products.pdf)

**II SEMESTER**

**FOUNDATIONAL ENGLISH II**

**Code: 21ENGU02F2**

**Credit:3**

**Contact Hours/Week:3**

**Marks:100**

GRLEB-VOC

**COMPUTER FUNDAMENTAL AND OFFICE AUTOMATION**

**Code:**

**Credit: 4**

**Contact Hours/Week:4**

**Marks:100**

GRU-BVOC



## UNIT OPERATIONS IN FOOD PROCESSING

Code: 21FPRV0209

Credit: 5

Contact Hours/Week:5

Marks:100

### Course Objectives:

- To provide the knowledge on preliminary processing concepts and principles
- To understand the mechanism, operation of equipment used in food processing

### Specific Learning outcomes:

After completion of this course, the students will be able to

- Identify the equipment used for primary processing
- Select appropriate method suitable for unit operations
- Plan a basic unit operations for food processing

### UNIT I Preliminary unit operation

Cleaning, sorting and grading – aims, methods and applications and physical properties of food materials.

### UNIT II Conveying

Belt conveyors, chain conveyors, screw conveyors, pneumatic conveyors, vibrating and oscillating conveyors, bucket elevators – their selection, operation and maintenance in food industries.

### UNIT III Size reduction and sieve analysis

Comminution, size reduction equipment: Crushers – grinders, ultrafine grinders, cutters, size enlargement. Sieving, separation based on size (mesh size), Types of screens: stationary screens – grizzlies, gyrating screens, vibratory screens, and effectiveness of screens.

### Unit IV Mixing & Agitation

Measurement of mixing, rate of mixing, liquid mixing, mixing equipments-liquid mixer, powder & particle mixer, dough & paste mixer, jet mixer, static mixer, purpose of agitation, agitated vessels – impellers, propellers & turbines, kneading, Homogenization - Principle & equipment.

### Unit V Separation Process

Filtration-principle of filtration; types of filtration. Equipment- filter press, rotary drum, shell & leaf filter, vacuum filter, centrifugal filter, filter media, filter aid, filter cake. Sedimentation meaning and principle. Equipment for sedimentation. Safe disposal methods of wastes in food separation.

## **Practical**

1. Determining physical properties of food ingredients
2. Demonstrating grading of fruits and vegetables
3. Exercise on grinding and sieving
4. Experiment on mixing and agitation
5. Separation of liquids by using filter paper
6. Separation of liquid by centrifuge
7. Visit to grading unit
8. Visit to fruit processing unit
9. Visit to milk processing unit
10. Visit to oil extraction unit

## **TEXTBOOK**

1. Singh, R.P. and Heldman, D.R. (2001), "Introduction to Food Engineering", 3rd ed., Academic Press.
2. Hui, Y.H. (2005), "Handbook of Food Science, Technology and Engineering" (vol.1-4), Marcel Dekker Publishers.
3. Rao, M.A., Rizvi, S.S.H. and Dutta, A.K. (2005), "Engineering properties of Foods", 3rd ed., Marcel Dekker Publishers.

## **REFERENCE BOOK**

1. Pandey, H., Sharma, H.K., Chouhan, R.C., Sarkar, B.C. and Bera, M.C. (2004), "Experiments in Food Process Engineering", CBS Publishers and Distributors.
2. Sharma, S.K., Mulvaney, S.J. and Rizvi, S.S.H. (2000), "Food Process Engineering: Theory and Laboratory Experiments", Wiley and Sons Publishers.

## **WEBOGRAPHY**

1. <https://www.slideshare.net/mobile/knowledge1995/agitaion-and-mixing>
2. <https://www.slideshare.net/mobile/vickyvicky76/mixing-79330350>
3. <https://www.slideshare.net/mobile/urveshprajapati3990/grinding-50256980>
4. <https://www.slideshare.net/mobile/prem1790/grinding-162817256>
5. <https://www.slideshare.net/mobile/khadeejaikram56/centrifugation-49732927>
6. <https://www.slideserve.com/orlando-butler/cleaning-sorting-and-grading-of-tomato>
7. <https://www.slideshare.net/mobile/JunaidAbbas5/sorting-and-grading>
8. <https://www.slideshare.net/mobile/ubaidulhai/filtration-and-clarification>

# GRAIN MILLING TECHNOLOGY

**Code:21FPRV0210**

**Credit: 3**

**Contact Hours/Week:3**

**Marks:100**

## **Course Objectives:**

- To know about the concepts and principles of grains processing and milling.
- To familiar with the equipment used for processing of grain
- To illustrate about the main products and byproducts of milling

## **Specific Learning Outcomes:**

After completing this course, the students will be able to

- understand the post harvest practices adopted for food grains
- apply the right post harvest practice for grains
- familiar with the equipment used for grain processing and milling
- explain the factors affecting grain processing and milling

## **UNIT I Introduction to Grain Processing**

Current scenario of food grain production, post-harvest losses; recommended pre-processing practices for handling of food grains for their safe storage, prevention and control of infestation during storage, National and International quality standards for grains.

## **UNIT II Paddy Processing**

Parboiling principle and practice, conventional and improved methods of parboiling, Theory of grain drying and grain driers, Physicochemical changes in paddy during parboiling, Parboiling advantages and limitations.

## **UNIT III Rice Milling**

Concept of rice milling, traditional rice milling process; modern rice milling process and the machinery used for milling, advantages and disadvantages of milling machineries - Factors affecting rice milling, products and byproducts of rice milling.

## **UNIT IV Wheat milling**

Structure and composition of wheat, quality characteristics and physicochemical properties of wheat, wheat milling process and milling equipment, products and by products of milling (Dalia, Atta, Semolina and flour); flour grades, quality characteristics and rheological properties of flours and their suitability for baked/other goods.

## **UNIT V Pulses Milling**

Structure and composition of pulses, quality characteristic and physicochemical properties of pulses, Varieties suitable for milling, pretreatments for difficult-to-mill (urad, arhar, moong, moth) and easy-to-mill (chana, masoor and pea) legumes, milling practices of different legumes, products and byproducts.

## **TEXTBOOK**

1. Dendy, DAV and Dobraszerk, B.J. Cereals and cereals Products- Chemistry and Technology, Aspen Publication 2001.
2. Kader A A: Post harvest technology of horticultural crops. 2nd edition, University of California
3. Chakraverty, A. (1995), "Post Harvest Technology of Cereals, Pulses and Oilseeds". Oxford and IBH Publishing Co, Calcutta.

## **REFERENCE BOOK**

1. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
2. Salunkhe D K and Kadam S S: Handbook of world food legumes, CRC Press, Florida.
3. Kent, N.L. Technology of Cereals, Wood Head Publishing, 4<sup>th</sup> edition 2004.

## **WEBOGRAPHY**

1. <https://www.slideshare.net/Senthil13k/wheat-42967958>
2. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5911>
3. <https://www.cooksinfo.com/flour-grades>
4. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5913>
5. <https://www.slideshare.net/LinaDarokar/milling-process-rice-dal>
6. <https://www.slideshare.net/tusharbhar96/parboiling-of-rice>
7. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5933>
8. <https://www.slideshare.net/tusharbhar96/parboiling-of-rice>
9. <https://www.slideshare.net/mobile/mahmudulmithun/postharvest-technology-of-agricultural-product>
10. <http://www.fao.org/3/ac301e/ac301e03.htm>

## GRAIN MILLING TECHNOLOGY PRACTICAL

**Code:21FPRV0211**

**Credit: 3**

**Contact Hours/Week: 3**

**Marks:100**

### **Course Objectives:**

- To understand the processing techniques of grains.
- To know the equipment used for processing of grain
- On successful completion of the subject, students will get exposure about Processing of cereals, pulses and storage of cereals

### **Specific Learning Outcomes:**

After completing this course, the students will be able to

- understand the post harvest practices and losses of food grains
- apply the right post harvest practice for grains
- familiar with the equipment used for grain processing
- explain the factors affecting grain processing

### **Practical**

1. Determine the quality of rice grains
2. Compare the milling quality of raw and parboiled rice
3. Estimate the gluten content of wheat
4. Determine the quality of wheat flour
5. Exercise on dry milling of pulses
6. Experiment on wet milling of pulses
7. Prepare a snack by utilizing rice byproduct
8. Prepare a snack by utilizing wheat by product
9. Prepare a snack by utilizing pulses byproduct
10. Visit to rice milling unit
11. Visit to wheat milling industry
12. Visit to pulse processing unit

### **TEXTBOOK**

1. Dendy, DAV and Dobraszerk, B.J. Cereals and cereals Products- Chemistry and Technology, Aspen Publication 2001.
2. Kader A A: Post harvest technology of horticultural crops. 2nd edition, University of California
3. Chakraverty, A. (1995), "Post Harvest Technology of Cereals, Pulses and Oilseeds". Oxford and IBH Publishing Co, Calcutta.

## **REFERENCE BOOK**

1. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
2. Salunkhe D K and Kadam S S: Handbook of world food legumes, CRC Press, Florida.
3. Kent, N.L. Technology of Cereals, Wood Head Publishing, 4<sup>th</sup> edition 2004.

GRLEB V OC

## **BAKERY AND CONFECTIONARY PRODUCTS**

**Code:21FPRV0212**

**Credit: 3**

**Contact Hours/Week:3**

**Marks:100**

### **Course Objectives:**

- To highlight the principles and concepts of baking and confectioneries.
- To understand the importance of quality control process in baked foods
- To acquire the knowledge about technology for manufacturing of confectionary products

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- Express the importance of raw material selection in production of quality products
- Develop novel food products by applying concept of baking and confectionary technology
- Evaluate and assess the quality of baked and confectionary foods

### **UNIT I Equipment used in bakery and confectionary industry**

Scope of bakery and confectionery in food industry, Construction and working of various equipment like mixers, proofing chambers, dough dividers, moulder and sheeter, baking ovens, cooling chamber, sealing and packaging machines, rolling and cutting machines.

### **UNIT II Principle of baking**

Baking meaning, principle, commonly used ingredients for bakery products, Types and quality of flour, dough development and chemistry.

### **UNIT III Technology for production of bakery products**

Unit operations for manufacturing of bread, biscuits, role of ingredients in preparing quality bakery products, factors influencing quality of bakery products, shelf life and storage practices.

### **UNIT IV Introduction to confectionary products**

Types of confectionary products - Characteristics of confectionary products - Ingredients used in confectionary products: Sugar boiled confectionery- crystalline and amorphous confectionery

### **UNIT V Manufacturing of confectionary products**

Processing of raw material, technology of manufacturing of toffee, chocolate, hard boiled candies, bars, chewing gums, bubble gums and Characteristics of finished products.

## **TEXTBOOK**

1. Pylar, E. J. and Gorton, L.A.(2009), “Baking Science & Technology” Vol.1 Fourth Edition,Sosland Publications.
2. Stanley P. Cauvain, Linda S. Young, (2008), “Baked Products: Science Technology and Practice”. John Wiley & Sons Publishers.
3. Zhou. W, Hui Y,H; (2014), “Bakery Products Science and Technology”, 2nd Edition, Wiley Blackwell Publishers,

## **REFERENCES**

1. Dubey SC. 2002. Basic Baking.The Society of Indian Bakers, New Delhi.
2. Francis FJ. 2000. Wiley Encyclopedia of Food Science & Technology. John Wiley & Sons.
3. Manley D. 2000.Technology of Biscuits, Crackers & Cookies. 2nd Ed. CRC Press



## **BAKERY AND CONFECTIONARY PRODUCTS PRACTICAL**

**Code:21FPRV0213**

**Credit: 3**

**Contact Hours/Week:3**

**Marks:100**

### **Course Objectives:**

- To highlight the processing methods used in baking and confectionery industries.
- To understand the importance of quality control process in baked foods
- To acquire the knowledge of manufacturing technology for confectionary products

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- Familiar with process and production of baked and confectionary foods
- Develop novel food products by applying concept of baking and confectionary technology
- Evaluate and assess the quality of baked and confectionary foods

### **Practical**

1. Introduction to Bakery and Confectionery Equipment
2. Determination of flour quality
3. Preparation of Bread and evaluation of its quality
4. Preparation of Cake and evaluation of its quality
5. Preparation of Biscuits and evaluation of its quality
6. Preparation of Cookies and evaluation of its quality
7. Preparation of Chocolate and evaluation of its quality
8. Preparation of Boiled candy and evaluation of its quality
9. Preparation of Toffee and evaluation of its quality
10. Preparation of Fudge and evaluation of its quality
11. Visit to small scale bakery unit
12. Visit to small scale confectionery unit
13. Visit to large scale bakery unit
14. Visit to large scale confectionery unit
15. Visit to sugar manufacturing unit

### **TEXTBOOK**

1. Pyler, E. J. and Gorton, L.A.(2009), "Baking Science & Technology" Vol.1 Fourth Edition, Sosland Publications.
2. Stanley P. Cauvain, Linda S. Young, (2008), "Baked Products: Science Technology and Practice". John Wiley & Sons Publishers.

3. Zhou. W, Hui Y,H; (2014), “Bakery Products Science and Technology”, 2nd Edition, Wiley Blackwell Publishers,

#### **REFERENCE BOOK**

1. Dubey SC. 2002. Basic Baking.The Society of Indian Bakers, New Delhi.
2. Francis FJ. 2000. Wiley Encyclopedia of Food Science & Technology. John Wiley & Sons.
3. Manley D. 2000.Technology of Biscuits, Crackers & Cookies. 2nd Ed. CRC Press

GRUBB VOC

## TECHNOLOGY FOR CONVENIENCE FOODS

Code:21FPRV0214

Credit: 4

Contact Hours/Week:4

Marks:100

### Course Objectives:

- To know the types of convenience foods available in the market
- To understand the science behind the production of convenience foods
- To provide knowledge on quality and safety of convenience foods

### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Identify and select the convenience food products based on consumer need
- Explain the method for preparation of convenience foods
- Evaluate and assess the quality of convenience foods

### UNIT I Introduction to convenience foods

Convenience Foods: Role, types: RTE, canned, frozen, dehydrate, ready prepared etc. advantages, uses, cost and contribution to diet

### UNIT II Food Extrusion

Definition, principles, Extruder types, mechanics, process and operation, uses of extruders in the food industry, extruded products, effect of extrusion on nutritional quality.

### UNIT III Minimal processing of foods with thermal methods

Canning, retort, microwave: meaning, principle, process, advantages and limitations.

### UNIT IV Minimal Processing of foods with non-thermal methods

Freezing, MAP, CAP: meaning, principle, process, advantages and limitations.

### UNIT IV Quality and Safety of convenience foods

Quality changes in minimally processed foods, microbial risks and health hazards- food contamination, food poisoning, food toxicants

## **Practical**

1. Identification of convenience foods available in the market
2. Doing a market survey about convenience foods.
3. Preparation of handmade noodles
4. Preparation of handmade spaghetti
5. Preparation of canned vegetable
6. Preparation of canned soup
7. Preparation of spice mix
8. Evaluation of canned foods
9. Visit to canning industry
10. Visit to pasta industry

## **TEXTBOOK**

1. Srivastava R. P. & Kumar Sanjeev, Sanjeev Kumar (2002). Fruit and Vegetable Preservation: Principles and Practices, International Book Distributing Company, Lucknow.
2. GirdhariLal, G.S. Siddappa, G.L. Tandon. (1998). Preservation of Fruits and Vegetables, ICAR Publication, New Delhi.
3. Riaz, M.N. (2000). Extruders in Food Applications, CRC Press, USA

## **REFERENCES BOOK**

1. Chavan U.D. and Patil J.V. (2013). Industrial Processing of Fruits and Vegetables. Daya Publishing House New Delhi.
2. Lusas, E.W. & Rooney, L.W.(2001). Snack Food Processing. CRC Press, USA.

## **WEBOGRAPHY**

1. <https://ecoursesonline.uasri.res.in>
2. <https://ccsuniversity.ac.in>

## III SEMESTER

### FOOD QUALITY EVALUATION (P)

Code:21FPRV0316

Credit: 3

Contact Hours/Week:3

Marks:100

#### Course Objectives

- To illustrate the concepts and principles of food quality evaluation
- To provide basic knowledge about sensory evaluation
- To know the instruments/tools available for objective evaluation

#### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Know with the basics of food quality evaluation
- Suggest a suitable technique for food quality evaluation
- Address the controlling factors in sensory and objective evaluation

#### UNIT I Introduction to Food quality

Food quality meaning, quality traits: sensory, chemical, microbial and toxicological aspects.

#### UNIT II Sensory evaluation

Definition of sensory evaluation; sensory attributes; human senses and sensory perception; factors influencing measurements: psychological and physiological errors.

#### UNIT III Sensory Evaluation methods

Classification of test methods; comparison: paired-comparison, duo-trio and triangle tests, ranking: numeric scoring test, hedonic scale, sensitivity and descriptive tests and procedures.

#### UNIT IV Objective methods for evaluation

Instruments/tools used for evaluation of sensory attributes such as colour, flavour, texture and taste, advantages and limitations.

#### UNIT V Applications of Sensory Analysis in the Food Industry

Quality control; storage stability testing; product development and consumer acceptance sampling and testing – AQL and Control Charts.

## **Practical**

1. Plan and design sensory evaluation lab
2. Identify the panellist based on threshold test
3. Conduct sensory evaluation of the given samples by discrimination test.
4. Perform sensory evaluation of the given samples by qualitative test
5. Evaluate sensory characteristics of given food by quantitative test
6. Texture analysis of raw and processed foods
7. Visit to sensory lab

## **TEXTBOOK**

1. Srilakshmi, B.(2003), "Food Science", New Age International Publishers, New Delhi
2. Maynard A. Amerine, Rose Marie Pangborn, Edward B. Roessler, (2013), "Principles of Sensory Evaluation of Food", Elsevier Publications.
3. Harry T. Lawless, HildegardeHeymann, (2010), "Sensory Evaluation of Food: Principles and Practices", Springer Science & Business Media.

## **REFERENCE BOOK**

1. Herbert Stone, Joel L. Sidel, (2012), "Sensory Evaluation Practices", Academic Press Publishers.
2. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC,
3. Amerine, Pangborn&Roessler (1965). Principles of Sensory Evaluation of food, Academic Press, London.

## PERSONALITY DEVELOPMENT

Code: 21FPRV0317

Credit: 3

Contact Hours/week:3

Marks :100

### Course Objectives:

- To understand the concept and principle of personality development.
- To know the importance of interpersonal relationship in team building and leadership
- To learn about conflict and stress management for effectiveness of working in industries.

### Specific learning outcome:

After completion of this course, the students will be able to,

- Develop a positive attitude in life
- Find solutions for every problems in life
- Develop interpersonal relationships and social skills

### UNIT I Introduction to personality development:

Definition, self understanding and monitoring, determinants- personality traits- theories of personality-importance of personality development- self awareness, Motivation, Relevance and types of Motivation, Motivating the subordinates, Analysis of Motivation

### UNIT II Interpersonal Relations

Introduction to Interpersonal Relations, Analysis of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position

### UNIT III Stress and Conflict Management

Introduction to Stress, Causes of Stress, Impact Stress, Managing Stress. Conflict: Introduction to Conflict, Causes of Conflict and conflict resolution.

### UNIT IV Time Management

Time as a Resource, Identify Important Time Management Wasters, Individual Time Management Styles, Techniques for better Time Management.

### UNIT V Leadership and team- building

Definition- leadership style-theories of leadership- qualities of an effective leader.Team building-meaning, types of teams, - importance of team building.

## **TEXTBOOKS**

1. S.NarayanaRajan.,B.Rajasekaran, G.Venkatasalapati.,V.Vijureshnayaham., Herald. “Personalikty Development”, publication division, M.S.University., Tirunalveli.
2. Stephan. P.Robbins.,(2008)., “ OrganisationalBehavoieur”, tenth edition., prentice hall of India., private limited, New Delhi.
3. Jit. S.Chandan., (2008), “Organisationalbehaviour”, third edition. Vikas publishing house private limited.

## **REFERENCES:**

1. Aswathappa, Organisational Behavior, Himalaya Publishing House, 12th edition, 2016.
2. P.Subba Rao, Management and Organisational behavior: Text, Cases and Games, Himalaya Publishing House, 1st edition, 2010.
3. Mullins, Organisational Behavior, Pearson Education Limited, 9th edition, 2010.
4. L.M.Prasad, OrganisationalBehaviour, 5th edition, Sultan Chand and Sons, New Delhi, 2014



# FOOD PRESERVATION- PRINCIPLES AND PRACTICES

Code:21FPRV0318    Credit: 3    Contact Hours/week:3    Marks: 100

## Course Objectives:

- To acquire knowledge about food spoilage and their causes
- To understand the concept and science behind preservation of foods
- To know about commonly used method of food preservation

## Specific Learning Outcome:

After completion of this course, the students will be able to

- Know the basics of food preservation
- Suggest suitable techniques for preservation of foods
- Apply the knowledge to improve the traditional method of preservation

## UNIT I Basics of food preservation

Food spoilage meaning, causes, mechanism, quality changes, perishable and non-perishable foods. Food preservation: Definition, importance, principles, traditional and modern methods of food preservation.

## UNIT II Preservation by Application of Heat

Preservation by use of high temperature: pasteurization, sterilization, canning advantages and limitations. Canning-history and steps involved, types of containers used for canning foods, spoilage encountered in canned foods.

## UNIT III Preservation by Low Temperature Storage

Refrigeration meaning and principle, advantages and disadvantages, freezing: meaning, principle types of freezing, the effect on quality (chilling, cold storage, freezing and deep freezing)

## UNIT IV Preservation by Removal of Moisture

Drying and dehydration meaning, merits and demerits, effect on food quality, methods of drying, factors affecting the process, Concentration: principles and types of concentrated foods.

## UNIT V Preservation by use of preservatives and fermentation

Preservative meaning, types- Class I and Class II preservatives, mechanism of action, merits and demerits. Preservation by fermentation- Definition, principle, method, advantages, disadvantages.

## TEXTBOOKS

1. Subalakshmi, G and Udipi, S.A. (2001), "Food processing and preservation". New Age International Publishers, New Delhi.
2. Girdharilal, G.S. and Siddappa (1986). "Preservation of Fruits and Vegetables". New Delhi: Publications and Information Division, ICAR.
3. Desoresier, W.N. and James, N. (1987). "The Technology of Food Preservation". New Delhi: CBS Publishers and Distributors.

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1. Gould, G. W. (2012), "New Methods of food preservation", Springer Science & Business Media.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
3. Srilakshmi, B. (2003), "Food Science", New Age International Publishers, New Delhi.

## WEBOGRAPHY

1. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=17055>
2. <https://www.speakingtree.in/allslides/10-traditional-ways-to-preserve-food-before-it-gets-expired/1-canning>
3. <https://www.slideshare.net/Selvaprakashnavaneethan/modern-trends-in-food-preservation-81331889>
4. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=5130>
5. <http://www.tiselab.com/pdf/Thermal-Processing-of-Food.pdf>
6. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=3098>
7. [http://ouat.nic.in/sites/default/files/6-sterilisation\\_of\\_milk\\_dairy\\_and\\_food\\_engineering.pdf](http://ouat.nic.in/sites/default/files/6-sterilisation_of_milk_dairy_and_food_engineering.pdf)
8. <http://courseware.cutm.ac.in/wp-content/uploads/2020/06/Advantages-and-Disadvantages-of-Canning.pdf>
9. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111469>
10. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111472>
11. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111472>
12. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111449>
13. <https://www.masterclass.com/articles/what-is-fermentation-learn-about-the-3-different-types-of-fermentation-and-6-tips-for-homemade-fermentation#what-are-the-3-different-types-of-fermentation>

## FOOD PRESERVATION – PRINCIPLES AND PRACTICES(P)

Code:21FPRV0319

Credit: 3

Contact Hours/week:3 Marks:100

### Course Objectives:

- To acquire knowledge about food spoilage and their causes
- To understand the concept and science behind preservation of foods
- To know about commonly used method of food preservation

### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Know the basics of food preservation
- Suggest suitable techniques for preservation of foods
- Apply the knowledge to improve the traditional method of preservation

### Practical

1. Reviewing signs/indications for food spoilage
2. Preservation of food by pasteurization/sterilization and evaluation of its quality
3. Preparation of canned foods and evaluation of its quality
4. Preservation of food by refrigeration storage and its effect on quality.
5. Preservation of food by freezing and its effect on quality
6. Preparation of sun dried food products and evaluation of its quality
7. Preparation of dehydrated food products and evaluation of its quality
8. Preservation of food by high concentration of sugar/salt
9. Preservation of foods by use of chemicals
10. Preservation of foods by addition of chemicals.
11. Preservation of foods by fermentation ( idli, dhokla)
12. Visit to any food processing industry.

### TEXTBOOKS

1. Girdharilal,G.S. and Siddappa (1986). “Preservation of Fruits and Vegetables”. New Delhi: Publications and Information Division, ICAR.
2. Desoresier,W.N. and James,N. (1987). “The Technology of Food Preservation”. New Delhi: CBS Publishers and Distributors.

## **REFERENCES:**

1. Subalakshmi, G and Udipi, S.A. (2001),“Food processing and preservation”. New Age International Publishers, New Delhi.
2. Gould, G. W. (2012), “New Methods of food preservation”, Springer Science & Business Media.
3. Srilakshmi, B.(2003), “Food Science”, New Age International Publishers, New Delhi.

GRU-BVOC

## **DAIRY PROCESSING**

**Code:21FPRV0320**

**Credit: 5**

**Contact Hours/week:5**

**Marks:100**

### **Course Objectives:**

- To familiar with steps involved in milk processing
- To know the types of machinery/equipment used for processing.
- To provide knowledge about value addition of milk.

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- Describe the composition and properties of milk
- Apply the knowledge to improve the shelf life of milk
- Spell out the processing line and machinery used for dairy processing

### **UNIT I Current scenario of dairy industry**

Scope, importance and need of dairy processing, various units within a dairy processing plant, handling and operating of machineries used in a dairy processing plant

### **UNIT II Milk composition and its properties**

Source of milk, Major and minor constituents of milk (Water, protein, lactose, fat, vitamin, mineral content), Colour, taste, pH, viscosity, boiling point, freezing point, specific heat.

### **UNIT III Basic operations in milk processing**

Grading of milk-definition and types of grades, Factors affecting milk quality, collection and transportation of milk, quality and quantity tests at milk reception, storage.

### **UNIT IV Processing of market milk**

Stages of processing: filtration, clarification, standardization, homogenization, pasteurization, sterilization, packaging and storage.

### **UNIT V In-plant cleaning systems**

Dairy plant cleaning solutions – Detergents, Sanitizers, cleaning procedure, Cleaning efficiency, Personal hygiene in dairy plant.

## **RELATED EXPERIENCE**

1. Quality evaluation of locally available milk
2. Detection of adulterants in milk
3. Analyze the factors affecting stability of milk
4. Testing the quality of pasteurized milk
5. Visit to local milk processing unit
6. Visit to modern milk industry

## **TEXTBOOKS**

1. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. (1999). “Dairy Technology – Principles of Milk Properties and Processes”. Marcel Dekker.
2. Aneja RP, Mathur BN, Chandhan RC & Banerjee AK. (2002). “Technology of Indian Milk Products”. Dairy India Publ., Delhi.
3. Alan H. Varnam, (2012), “Milk and Milk Products: Technology, chemistry and microbiology”, Springer Science & Business Media Publishers.

## **REFERENCES**

1. Robinson, R. K., (2012), “Modern Dairy Technology: Volume 2 Advances in Milk Products”, Springer Science & Business Media Publishers.
2. Smit G. (2003). “Dairy Processing – Improving Quality”. CRC-Woodhead Publ.

## **WEBOGRAPHY**

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2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=4164>
3. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147906>
4. [https://www.powershow.com/view/126090-MDVmN/MILK\\_PROCESSING\\_powerpoint\\_ppt\\_presentation](https://www.powershow.com/view/126090-MDVmN/MILK_PROCESSING_powerpoint_ppt_presentation)
5. <https://www.slideshare.net/mobile/ubaidulhai/filtration-and-clarification>
6. <http://www.reildairy.com/forms/RMRD.aspx#:~:text=The%20Raw%20Milk%20Reception%20Dock,located%20over%20a%20wide%20area.>
7. <https://en.m.wikipedia.org/wiki/Pasteurization>
8. <https://www.slideshare.net/mobile/ChinmaiDastikop/homogenization-of-milk>
9. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6160>
10. <https://www.slideshare.net/mobile/sharonabduljameela/packaging-and-storing-of-milk>
11. <https://www.slideshare.net/irshad2k6/factors-affecting-quality-and-quantity-of-milk-in-dairy-cattle>

## FOOD LABORATORY AND SAFETY PRACTICES

**Code: 21FPRV0321      Credits: 3      Credit hours/ week: 3      Marks:100**

### **Course Objectives:**

- To understand the basic needs and requirements of a laboratory
- To provide knowledge about laboratory waste disposal and management
- To know about the hazards and safety measures to be followed in a laboratory

### **Specific learning outcomes:**

**After completion of this course, the students will be able to,**

- Plan for basic operations in the lab and maintain cleanliness in the laboratory
- Handle, operate/work safely in the laboratory
- apply the knowledge to prevent accidental injuries/hazards in the laboratory

### **UNIT I Design of laboratories**

The essential requirements of a laboratory, space, design of laboratories, fixed and flexible design laboratories, furniture and storage services, ventilation, flooring.

### **UNIT II Inventory Management**

Inventory Management: Planning, control and costing. Stores & storekeeping, scope & importance, purchase procedure, types of purchase, location of stores & materials, procedure for the movement of stores, different methods of pricing materials, store records.

### **UNIT III Management of lab equipment**

Access to the laboratories, maintenance of equipment, apparatus and furniture, servicing of equipment, prevention of equipment from rust, dust, vibration, correct usage of instruction manual.

### **UNIT IV Cleaning of laboratories and preparation rooms**

Colour coding of services, emergencies with services, emergency procedures for flooding and gas leaks, proper cleaning of laboratories.

## **UNIT V Laboratory hazards and safety measures**

Hazardous chemicals and hazardous apparatus, laboratory hazards (biological, chemical, physical, electrical and psychological), emergency response related to injuries, spills and use of spill kits, laboratory evacuation, isolation, elimination, minimisation of hazardous level of chemicals, accident and incident records, use of goggles, protective footwear, safe work practices.

### **TEXTBOOKS**

1. Pomeranz, Y. and Meloan, C.E. (1996). Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi
2. Susanne Nielson (2017). Food Analysis, Springer Technology and Engineering.

### **REFERENCES**

1. National committee for clinical laboratory standards, (1996), Clinical laboratory manuals, 3 rd edition, approved guideline 3P2-3 A, Villanova, Pa.
2. Rao. S. (2010), "Testing Commissioning Operation & Maintenance of Electricalequipments; Khanna publishers.

### **WEBOGRAPHY**

1. <https://www.preservearticles.com/education/what-are-the-basic-requirements-of-a-laboratory-management/18760>
2. <https://www.slideshare.net/mobile/nfs7/store-management>
3. <https://www.slideshare.net/mobile/RohitArora236/storekeeping-117822306>
4. <https://www.slideshare.net/mobile/VarshaShahane/laboratory-safety>
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6. <https://www.slideshare.net/TriumvirateEnvironmental/laboratory-decontamination>
7. <https://www.slideshare.net/harshkhatri9083/first-aid-ppt>
8. <https://www.slideshare.net/VarshaShahane/emergency-management-in-laboratories>
9. <https://chemlab.truman.edu/laboratory-safety/emergency-procedures/>
10. <https://www.safety.uwa.edu.au/incidents-injuries-emergency/procedures/lab#biological>
11. <https://www.slideshare.net/VarshaShahane/emergency-management-in-laboratories>
12. <https://www.slideshare.net/prdiphamal/laboratory-hazard>
13. [https://slideplayer-com.cdn.ampproject.org/v/s/slideplayer.com/amp/9443277/?amp\\_js\\_v=a6&amp\\_gsa=1&](https://slideplayer-com.cdn.ampproject.org/v/s/slideplayer.com/amp/9443277/?amp_js_v=a6&amp_gsa=1&)



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14. <https://www.slideshare.net/RambabuPalaka/hazardous-waste-management-121216869>

15. <https://www.slideshare.net/saidwarsame/lecture-8laboratory-accidents-and>

GRLE-BVOC

## FOOD LABORATORY AND SAFETY PRACTICES (P)

**Code: 21FPRV0322**

**Credits: 3**

**Credit hours/ week: 3**

**Marks:100**

### **Course Objectives:**

- To understand the basic needs and requirements of a laboratory
- To provide knowledge about laboratory waste disposal and management
- To know about the hazards and safety measures to be followed in a laboratory

### **Specific learning outcomes:**

After completion of this course, the students will be able to,

- Plan for basic operations in the lab and maintain cleanliness in the laboratory  
Handle, operate/work safely in the laboratory
- apply the knowledge to prevent accidental injuries/hazards in the laboratory

### **Practical**

1. Identification of various apparatus and glassware
2. Preparation of solutions in different concentrations (0.1, 1 & 10%)
3. Preparation of solution in different molar concentrations (0.1, 1 & 10M)
4. Preparations of solutions in different normal concentrations (0.1, 1 & 10N).
5. Preparation of acids and buffers
6. Cleaning/calibration of equipment
7. Demonstration of first-aid for lab accidents
8. Demonstration of fire extinguishers handling and operation
9. Plan and exercise emergency drill
10. Visit to food testing laboratories.

### **TEXTBOOKS**

1. Pomeranz, Y. and Meloan, C.E. (1996). Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi
2. Susanne Nielson (2017). Food Analysis, Springer Technology and Engineering.

### **REFERENCES**

1. National committee for clinical laboratory standards, (1996), Clinical laboratory manuals, 3 rd edition, approved guideline 3P2-3 A, Villanova, Pa.
2. Rao. S. (2010), "Testing Commissioning Operation & Maintenance of Electrical equipments; Khanna publishers.

## **WEBOGRAPHY**

1. <https://www.slideshare.net/RIZWANABBAS3/buffer-solution-81189860>
2. <https://www.slideshare.net/mobile/HiwrHastear/laboratory-safety-54228792>
3. <https://www.slideshare.net/mobile/zoraizhaiderzoraizhaider/buffers-60163379>
4. <https://www.slideshare.net/mobile/PrakashPokhre11/ph-and-buffer>
5. <https://www.google.com/search?q=preparation+of+acids+and+buffers+ppt&oq=preparation+of&aqs=chrome.1.69i57j35i39j35i19i39j0i19l2.8375j0j7&client=ms-android-oppo&sourceid=chrome-mobile&ie=UTF-8>
6. <https://www.slideshare.net/mobile/AHMEDTAXONOMIST/solutions-preparation>

GR11-BVOC

## FOOD PACKAGING

Code:21FPRV0323

Credit: 3

Contact Hours/week:3

Marks:100

### Course Objectives:

- To understand the technology behind packaging and packaging materials
- To provide knowledge about development in food packaging technologies and materials.

### Specific Learning Outcome:

After completion of this course, the students will be able to

- know the properties of different packaging materials
- familiar with various methods of packaging to improve the shelf life
- Select appropriate packing material and packaging technology for any food products

### UNIT I Introduction to packaging

Definition, Functions of packaging – Containment, Protection, Preservation, Promotion, Convenience, Communication. Requirements of effective package, Types of food packaging- primary, secondary and tertiary packaging.

### UNIT II Packaging Materials and their properties

Rigid containers- Glass, Wooden boxes, metal cans- Aluminium and tin plate containers, Semi rigid containers- paperboard cartons, Flexible packaging- paper, plastic pouches- Low density polyethylene, High density polyethylene and Polypropylene. Packaging materials for dairy products, bakery and confectionary, granular products, fruits and vegetables.

### UNIT III Packaging of different foods

Factors determining the packaging requirements of various foods, Packaging of perishable and processed foods, Packaging materials suitable for packing of fresh produce from plant sources and animal sources, packaging materials suitable for packing of processed products. Quality criteria for packaging materials.

### UNIT IV Packaging Technologies

Ordinary packaging, vacuum packaging, Aseptic packaging, Active packaging, Intelligent packaging, Modified atmospheric packaging and controlled atmospheric packaging, Shrink packaging, stretch packaging, Biodegradable packaging, Edible packaging, Tetrapacks.

### UNIT V Printing, Labelling and safety concerns in food pack

Printing process, inks, adhesives, labelling, coding- bar codes, Food packaging closures of glass and plastic containers, Legislative and safety regulations aspects of food packaging.

## **Practical**

1. Determine grease resistance of packaging materials.
2. Estimate water vapour transmission rate of various packaging materials.
3. Analyze tensile strength of packaging material
4. Determine gaseous exchange rate of packaging materials
5. Test chemical resistance of packaging material.
6. Shelf life studies of packed foods.
7. Edible coating of fruits and vegetables
8. Evaluate labelling mandate in commercial packaging
9. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.

## **TEXTBOOKS**

1. Gordon L. Robertson (2012), "Food Packaging: Principles and Practice", Third Edition, CRC Press.
2. Takashi Kadoya (2012), "Food Packaging", Academic press.
3. Richard Coles, Derek McDowell, Mark J. Kirwan (2003), "Food Packaging Technology", CRC Press.

## **REFERENCES**

1. Mathlouthi, M. (1999), "Food packaging and Preservation". Aspen Publications.
2. Ahvenainen, Raija. (2003) "Novel Food Packaging Techniques". Wood Head Publishing.
3. Paine, F.A. and Paine, H.Y. (1983). A Handbook of Food Packaging. Leonard Hill, Glasgow, UK

## PROCESSING OF SUGAR, SALT AND JAGGERY

Code:21FPRV0324

Credit: 2

Hours/Week: 2 Marks: 50

### Course Objectives:

- To understand the concept of manufacturing sugar, salt and jaggery
- To provide extensive knowledge on different processing methods

### UNIT I

Manufacturing of raw sugar, Clarification process, Crystallization process, Centrifugal process

### UNIT II

Manufacturing of refine sugar, Types of refineries, Mingling and affination process. Clarification of refine melt, Evaporation and crystallization, Specification of refine sugar

### UNIT III

Raw materials for salt manufacturing, Manufacturing process- Processing rock salt and processing brine. Methods of salt production – Solar Evaporation method, Rock Salt Mining Method, Vacuum evaporation Method.

### UNIT IV

Manufacturing of Jaggery and Jaggery powder. Extraction and clarification of juice, Concentration of juice to rab, Drying and packing of Jaggery. Crystallization process of Jaggery powder. Curing. Drying and packing of Jaggery powder

### UNIT V

Production of jaggery – Traditional and modern methods. Packaging of jaggery.

### REFERENCE:

Chung Chi Chou (2000). Handbook of Sugar Refining: A Manual for the Design and Operation of Sugar Refining Facilities, Wile.

Manufacture and refining of raw sugar -V.E . Baikow

### WEB REFERENCE:

<https://www.mortonsalt.com/salt-production-and-processing/>

<http://www.madehow.com/Volume-2/Salt.html>

<http://www.iifpt.edu.in/pmfme/jaggerymet.pdf>

**SEMESTER IV**  
**INTERNET AND WEB TECHNOLOGY**

**Code:**                      **Credit:4**    **Contact Hours/week:4**    **Marks:100**

**(Course will be offered by the Department of Computer Science Applications, GRI)**

GRI-BVOC

**GANDHI'S LIFE, THOUGHT, WORK**

**Code:21GSPSU001**

**Credit: 2**

**Contact Hours/week: 2**

**Marks:50**

GRU-BVOC



## **MILK PRODUCTS TECHNOLOGY**

**Code:21FPRV0426    Credit: 3    Contact hours/week:3    Marks:100**

### **Course Objectives:**

- To understand the basic operations in the manufacturing of milk products
- To provide knowledge about value addition of milk and utilization of its by products.

### **Specific Learning Outcome:**

After completion of this course, the students will be able to

- know the process involved in the production of various milk based products
- familiar with machineries used for the manufacturing of milk products
- Select appropriate techniques for testing of milk products quality

### **UNIT I Technology for fluid milk production**

Standardized milk, pasteurized milk, toned milk, double toned milk, flavoured milk, recombined milk etc.

### **UNIT II Technology for condensed milk production**

Evaporation meaning and principle, milk evaporators-types, mechanism, merits and demerits

### **UNIT III Technology for milk powder manufacturing**

Drying/dehydration of milk, types of driers used for the processing, merits and limitations.

### **UNIT IV Technology for Fermented milk products Manufacturing**

Method for manufacture of milk powder, butter, cheese, ice cream, khoa, channa, paneer, shrikhand, ghee, curd, yoghurt.

### **UNIT V Milk substitutes**

Lactone, spray dried infant foods, whey, ghee residue and imitation milk.

### **TEXTBOOKS**

1. Aneja RP, Mathur BN, Chandhan RC & Banerjee AK. (2002). "Technology of Indian Milk Products". Dairy India Publ., Delhi.
2. Alan H. Varnam, (2012), "Milk and Milk Products: Technology, chemistry and microbiology", Springer Science & Business Media Publishers.

## REFERENCES

1. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. (1999). “Dairy Technology – Principles of Milk Properties and Processes”. Marcel Dekker.
2. Robinson, R. K., (2012), “Modern Dairy Technology: Volume 2 Advances in Milk Products”, Springer Science & Business Media Publishers.
3. Smit G. (2003). “Dairy Processing – Improving Quality”. CRC-Woodhead Publ.

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1. <https://www.slideshare.net/bknanjwade/drying-53262955>
2. <https://www.slideshare.net/mobile/phuonghong290/milk-powder>
3. <https://www.vegrecipesofindia.com/chaas-recipe-buttermilk-recipe/>
4. <https://www.slideshare.net/mobile/akankshashrivastava3/spray-drying-54159904>
5. <https://www.slideshare.net/mobile/pallaviBS4/spray-drying-pdf-in-food-industry>
6. <https://www.slideshare.net/mobile/ChethanN23/ghee-residue>
7. <https://www.slideshare.net/mobile/ankitabroad/fermented-milk-products>
8. [https://www.slideshare.net/mobile/Ajay\\_1969/malai-kulfi](https://www.slideshare.net/mobile/Ajay_1969/malai-kulfi)
9. <https://www.slideshare.net/mobile/harishsurapureddy/khoa-60507939>
10. <http://calon.catpictures.co/khoa-preparation-flow-chart/>
11. <https://www.slideshare.net/mobile/prathameshkudalkar7/dehydration-of-milk>
12. <https://www.whiskaffair.com/kesar-elaichi-srikhand/>
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## MILK PRODUCTS TECHNOLOGY PRACTICAL

**Code:21FPRV0427      Credit: 3      Contact Hours/week:3      Marks: 100**

### Course Objectives:

- To understand the basic operations in the manufacturing of milk products
- To provide knowledge about value addition of milk and utilization of its by products.

### Specific Learning Outcome:

After completion of this course, the students will be able to

- know the process involved in the production of various milk based
- products familiar with machineries used for the manufacturing of milk
- products Select appropriate techniques for testing of milk products quality

### Practical

1. Determine the Casein content of the milk.
2. Check the sterility of milk by Turbidity test.
3. Preparation of Flavoured milk
4. Preparation of Curds and Shrikhand
5. Preparation of Khoa
6. Preparation of Paneer
7. Preparation of Ice-cream and Kulfi
8. Preparation of dahi, cream, buttermilk and paneer.
9. Preparation and quality valuation of spray dried milk
10. Visit to industrial units-curd, buttermilk, paneer and ice-cream

### TEXTBOOKS

1. Aneja RP, Mathur BN, Chandhan RC & Banerjee AK. (2002). "Technology of Indian Milk Products". Dairy India Publ., Delhi.
2. Alan H. Varnam, (2012), "Milk and Milk Products: Technology, chemistry and microbiology", Springer Science & Business Media Publishers.

### REFERENCES

1. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. (1999). "Dairy Technology – Principles of Milk Properties and Processes". Marcel Dekker.
2. Robinson, R. K., (2012), "Modern Dairy Technology: Volume 2 Advances in Milk Products", Springer Science & Business Media Publishers.
3. Smit G. (2003). "Dairy Processing – Improving Quality". CRC-Woodhead Publ.

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2. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5911>
3. <https://www.cooksinfo.com/flour-grades>
4. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5913>
5. <https://www.slideshare.net/LinaDarokar/milling-process-rice-dal>
6. <https://www.slideshare.net/tusharbhar96/parboiling-of-rice>
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9. <https://www.slideshare.net/mobile/mahmudulmithun/postharvest-technology-of-agricultural-product>
10. <http://www.fao.org/3/ac301e/ac301e03.htm>

## FOOD ANALYSIS AND QUALITY TESTING

**Code:21FPRV0428 Credit: 4 Contact Hours/week:4 Marks:100**

### Course Objectives:

- To understand the concept of sampling and preparation for testing of food quality
- To provide knowledge about methods used for testing of food

### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Select suitable methods for analysis of food quality
- Explain the principle, mechanism and applications of instruments for food analysis
- Apply the knowledge to identify contaminant/adulterant in the foods

### UNIT I Introduction to food quality

Definition of quality and concepts, quality attributes (safety, sensory, shelf life, convenience, extrinsic attributes), factors affecting food quality.

### UNIT II Methods of food analysis

Methods: Titration, colorimeter, calorimetry, chromatography principle, types, instrumentation, advantages and limitations.

### UNIT III Nutrient analysis

Sampling – objectives, Guidelines, Methods. Analysis of Food: Moisture, Carbohydrate, Fat, Protein, Crude Fibre, Vitamins and Minerals.

### UNIT IV Non-nutrient analysis

Phytochemicals: alkaloids, tannin, glycosides etc. antinutritional factors: Trypsin inhibitor, favism, lathyrism, etc., additives: colours, flavours, sweeteners etc.

### UNIT V Contaminant/toxicant analysis

Heavy metals, pesticide residues, veterinary drug residues, environmental pollutants, adulterants.

## **TEXTBOOKS**

1. Pomeranz, Y. and Meloan, C.E. (1996). Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi
2. Ranganna, S. (1986). Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2<sup>nd</sup> Edition, Tata Mc Graw hill Publishing Co Ltd., New Delhi

## **REFERENCES**

1. Kher, C.P. (2000). Quality control for the food industry. ITC Publishers, Geneva.
2. Early, R. (1995). Guide to Quality Management Systems for the Food Industry, Blackie, Academic and Professional, London
3. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance for the Food Industries, CTI Publications Inc, Baltimore

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1. <https://ncert.nic.in/textbook/pdf/lehe106.pdf>
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1019>
3. <https://digital.csic.es/bitstream/10261/109484/4/ADVANCED%20ANALYSIS%20OF%20CARBOHYDRATES.pdf>
4. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=90220>
5. <http://www.fao.org/3/AM808E/AM808E.pdf>
6. <https://www.mdpi.com/2223-7747/6/4/42/pdf>

## FOOD ANALYSIS AND QUALITY TESTING PRACTICAL

**Code:21FPRV0429 Credit: 4 Contact Hours/week:4**

**Marks:100**

### Course Objectives:

- To understand the methods of food quality analysis
- To provide hands on training in food testing and quality analysis

### Specific Learning Outcomes:

After completion of this course, the students will be able to

- Familiar with the food testing methods
- Know about the equipment used in food analysis

### Practical

1. Preparation of standard solutions for the chemicals solutions and buffers for analysis
2. Determination of moisture content of food
3. Determination of fat content of food
4. Determination of protein content of food
5. Determination of crude fiber content of food
6. Determination of ash content of food
7. Estimation of calcium and iron content of food
8. Estimation of pH and Total Acidity
9. Determination of antinutritional factors in foods
10. Determine the permissible level of food additives
11. Detection of adulterants in food
12. Test for detection of pesticide residues in food
13. Visit to food testing lab

### TEXTBOOKS

1. Pomeranz, Y. and Meloan, C.E. (1996). Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi
2. Ranganna, S. (1986). Handbook of Analysis and Quality Control for Fruit and Vegetable Products, 2<sup>nd</sup> Edition, Tata Mc Graw hill Publishing Co Ltd., New Delhi

### REFERENCES

1. Kher, C.P. (2000). Quality control for the food industry. ITC Publishers, Geneva.
2. Early, R. (1995). Guide to Quality Management Systems for the Food Industry, Blackie, Academic and Professional, London
3. Gould, W.A. and Gould, R.W. 1988. Total Quality Assurance for the Food Industries, CTI Publications Inc, Baltimore

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2. <https://rfssh.wordpress.com/2014/09/25/estimation-of-crude-fibre/>
3. <https://discoverfoodtech.com/soxhlet-extraction-method/>
4. <https://discoverfoodtech.com/protein-estimation-by-kjeldahl-method/>
5. <https://cwsimons.com/determination-of-ash-content/#:~:text=Ash%20content%20represents%20the%20inorganic,at%20500%20%E2%80%93%20600%20oC.&text=Ash%20content%20determination%20is%20widely,quality%20measure%20for%20flour%20extraction.>
6. <http://egyankosh.ac.in/bitstream/123456789/33675/1/Practical%208.pdf>



## FOOD MICROBIOLOGY (T)

Code:21FPRV0430

Credit: 2

Contact Hours/week:2

Marks:50

### Course Objectives:

- To understand the role of microorganism in food
- To know the factors influencing microorganism growth
- To recognize the spoilage microorganisms in food

### Specific Learning Outcomes:

After completion of this course, the students will be able to

Describe the characteristics of beneficial and spoilage microorganisms Signify the contributions of microorganisms to food and health Identify the microorganisms responsible for spoilage of foods.

#### UNIT I Introduction to food microbiology

Discovery, current status, role of food microbiology, sources of micro organisms in food, changes caused by microorganisms - food fermentation, putrefaction, lipolysis.

#### UNIT II Characteristics of microorganisms

Classification of microorganisms, nomenclature, morphology – yeast and moulds, bacterial cells, viruses. Growth and survival of microorganisms in foods, food hygiene and sanitation: Contamination during handling and processing and its control; indicator organisms.

#### UNIT III Beneficial uses of microorganisms

Microorganisms used in food fermentation, mechanisms of nutrient transport, application in genetics, intestinal bacteria and probiotics, food bio preservatives of bacterial origin, food ingredients and enzymes of microbial origin.

#### UNIT IV Microbial spoilage of food

Food spoilage – Introduction, spoilage in cereals, vegetables and fruits, meat, eggs, poultry, fish, milk and milk products, canned foods, nuts and oil seeds, fats and oil seeds. Definition - food infection and food intoxication.

#### UNIT V Microbial examination and investigation

General Microbiological Methods of enumeration and isolation of bacteria and fungi: conventional (serial dilution/pour plate technique) and modern methods (RIA, ELISA, PCR).

## **TEXTBOOKS**

Frazier. W.C.,andWesthoff D.C. (1992), “Food Microbiology”, Tata McGraw Hill Publishing Co., Ltd., New Delhi.

Adams ,Martin R, Maurice O Moss, Peter McClure (2015), “Food Microbiology”, Royal Society of Chemistry, Cambridge.

Jay, James M.(2012), “Modern Food Microbiology”, Springer Science & Business Media., Maryland.

## **REFERENCES**

1. Ray ,Bibek; ArunBhunia,(2013), “Fundamental Food Microbiology”, CRC Press. 2. Bibek Ray. “ Fundamental food microbiology”. CRC Press. 3rd Edition. 2005.

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## FOOD MICROBIOLOGY (P)

**Code:21FPRV0431    Credit: 3    Contact Hours/week:3    Marks:100**

### **Practical**

1. Demonstration of microscope parts and its utility
2. Use of microscope to identify and differentiate bacteria, yeast and mold
3. Preparation of glassware and media for microbial testing
4. Use and care of laminar air flow chamber
5. Staining of microorganisms and their examination.
6. Determination of Total Plate Count (TPC), viable counts in foods
7. Isolation of bacteria in food
8. Enumeration of yeast and mould in food
9. Microbiological examination of potable water: Total and coliform count.
10. Preparation of yoghurt
11. Visit to industry

### **TEXTBOOKS**

1. Frazier. W.C.,andWesthoff D.C. (1992), "Food Microbiology", Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Adams ,Martin R, Maurice O Moss, Peter McClure (2015), "Food Microbiology", Royal Society of Chemistry, Cambridge.
3. Jay, James M.(2012), "Modern Food Microbiology", Springer Science & Business Media., Maryland.

### **REFERENCES**

1. Ray ,Bibek; ArunBhunia,(2013), "Fundamental Food Microbiology", CRC Press.
2. Bibek Ray. "Fundamental food microbiology". CRC Press. 3rd Edition. 2005.

## FOOD QUALITY ASSURANCE

**Code:21FPRV0432**

**Credit: 3**

**Contact Hours/week:3**

**Marks:100**

### **Course Objectives:**

- To understand food laws and regulations governing the quality of foods
- To know about Intellectual property rights
- To identify the factors affecting food quality assurance

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- Describe the laws and standards related to food quality assurance
- Signify the importance of intellectual property rights to avoid food
- frauds Apply the knowledge to maintain quality in food industries.

### **UNIT I Concepts of quality management**

Objectives, importance and functions of quality control, Quality management systems in India, Sampling procedures and plans, Food Safety and Standards Act, 2006, Domestic regulations, Global Food safety Initiative.

### **UNIT II Food Laws and Standards**

Organizations dealing with inspection, traceability and authentication, certification and quality assurance - PFA, FPO, MMPO, MPO, AGMARK, BIS; Labeling issues, International food standards.

### **UNIT III Food quality control**

Concepts of quality control, Need and importance of quality control programmes such as quality plan, documentation of records, product standards Product and purchase specifications and process control; Duties and responsibilities of food quality controller.

## **UNIT IV Food Quality Assurance**

Concept of quality assurance, need and importance, Total Quality Management, GMP/GHP, GLP, GAP, Sanitary and hygienic practices, Quality manuals, documentation and audits.

## **UNIT V Food Quality System**

Indian & International quality systems and standards like ISO and Food Codex, Export import policy, Hazard analysis Critical Control Point: Definition, principles, Guidelines for the application of HACCP system.

### **TEXTBOOKS**

1. Kher, C.P. Quality control for the food industry. ITC Publishers, Geneva. 2000.
2. Philip, A.C. Reconceptualizing quality. New Age International Publishers, Bangalore.

### **REFERENCES**

1. Yong-Jin Cho, Sukwon Kang.(2011), “Emerging Technologies for Food Quality and Food Safety Evaluation” ,CRC Press.
2. AllInteaz, (2003), “Food Quality Assurance: Principles and Practices”, CRC Press.
3. Vasconcellos J. Andres, (2003), “Quality Assurance for the Food Industry: A Practical Approach”,CRC Press.

### **WEBOGRAPHY**

1. <https://www.yourarticlelibrary.com/production-management/quality-control-meaning-importance-definition-and-objectives/26174>
2. <http://www.fao.org/3/i1379e/i1379e05.pdf>
3. [https://www.indiacode.nic.in/bitstream/123456789/7800/1/200634\\_food\\_safety\\_and\\_standards\\_act%2C\\_2006.pdf](https://www.indiacode.nic.in/bitstream/123456789/7800/1/200634_food_safety_and_standards_act%2C_2006.pdf)
4. [https://ourworldisnotforsale.net/2017/Domestic\\_Regulation.pdf](https://ourworldisnotforsale.net/2017/Domestic_Regulation.pdf)
5. <https://www.grains.k-state.edu/spirel/docs/conferences/mb-alternatives/presentation/m%20olewnik.pdf>
6. [https://en.wikipedia.org/wiki/Global\\_Food\\_Safety\\_Initiative](https://en.wikipedia.org/wiki/Global_Food_Safety_Initiative)
7. <https://www.invensislearning.com/blog/quality-control-inspector-roles-responsibilities/>
8. <https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/haccp-principles-application-guidelines>

9. [http://www.eximguru.com/exim/guides/export-finance/ch\\_13\\_exim\\_policy.aspx#:~:text=Export%20Import%20Policy%20or%20better.and%20Regulation%20Act\)%2C%201992.](http://www.eximguru.com/exim/guides/export-finance/ch_13_exim_policy.aspx#:~:text=Export%20Import%20Policy%20or%20better.and%20Regulation%20Act)%2C%201992.)
10. <http://www.fao.org/3/t0396e/t0396e.pdf>

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## SEMESTER V

### FOOD BUSINESS MANAGEMENT

**Code:21FPRV0534**

**Credit: 3**

**Contact Hours/week:3**

**Marks:100**

#### **Course Objectives:**

- To understand concept and principle of management
- To know the scopes and importance in food business management
- To provide knowledge about trade and marketing.

#### **Specific Learning Outcome:**

After learning this course, the students will be able to,

- Explain the scope and importance of management in food business
- Describe the line of management and the rules for effective management
- Outline the agencies related to food trade and marketing

#### **UNIT I Introduction to Management**

Meaning, nature and characteristics of Management - Scope and functional areas of management - Management as a science art or profession - Management & Administration – Principles of management - Social responsibility of management.

#### **UNIT II Principles of management I**

Planning: Nature, importance and purpose, Planning process, objectives - Types of plans, Organisation: Principles of organisation, Types of organization, Organisation Chart- Organisation manual, Nature and importance of staffing - Process of selection & recruitment.

#### **UNIT III Principles of management II**

Directing: Meaning and nature of directing, Motivation: meaning & importance, Theories of Motivation, Leadership: Meaning Styles, Coordination: Meaning and importance.

Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control-Control by Exception.

## **UNIT IV Food business opportunities and challenges**

Patterns and types of food consumption across the globe, ethnic food habits of different regions, consumer behaviour, export trends and prospects of food products in India, food industry management, marketing management, sectors in food industry and scale of operations in India

## **UNIT V Food Trade and marketing**

Foreign exchange, mechanics of foreign exchange, role of WTO, GATT, international trade in agriculture, world trade agreements, APEDA, Tea board, spice board, MoFPI,etc., management of export and import organisation, registration , documentation, export import logistics.

### **TEXTBOOKS**

1. Chhhabre TN &SuriaRK(2001), ” Management process and Perspectives”, KitabMahal.
2. Prasad L.M. (2011). “Principles and Practice of Mangement”,Published by Sultan Chand & Sons.
3. Kotler. P,(2000), “Marketing Management”, Prentice hall.

### **REFERENCES**

1. Harmon, P. (2007), Business Process Change : A Guide for Business Managers and BPM and Six Sigma Professionals, Elsevier/Morgan Kaufmann Publishers.
2. R. Anupindi et al. (2006), Managing Business Process Flows: Principles of Operations Management, Pearson Education Inc.



## **ENTREPRENEURSHIP DEVELOPMENT**

**Code:21FPRV0535 Credit: 3 Contact Hours/week:3 Marks:100**

### **Course Objectives:**

- To understand the role and importance of entrepreneurs in nation building
- To imbibe the qualities of entrepreneur
- To know about the agencies supporting for entrepreneurship development programmes

### **Specific Learning Outcomes**

After completion of this course, the students will be able to

- Describe the features of government programmes for entrepreneurship development
- Know the characteristics/traits of an entrepreneur
- Inculcate entrepreneurial skills to become entrepreneur

### **UNIT I Introduction**

Concepts of entrepreneur, entrepreneurship and entrepreneur - Characteristics and competencies of a successful entrepreneur - General functions of an entrepreneur - Type of entrepreneurs - Role of entrepreneur in economic development - Distinction between an entrepreneur and a manager - Entrepreneur and Intrepeneur.

### **UNIT II Entrepreneurship development**

Emergence of entrepreneurship - Economic and non economic factors for stimulating entrepreneurship development - Obstacles to entrepreneurship development in India - Growth of entrepreneurship in India.

### **UNIT III Entrepreneurial Development Programmes**

Concept and meaning of entrepreneurship development - Need for entrepreneurship development programmes (EDPs) - Objectives of EDPs - Organizations for EDPs in India; NIESBUD, SISI their roles and activities.

## **UNIT IV Growth of Entrepreneurship**

Schemes for assistance – State and Central level current schemes and programmes for individual and group support. SIDCO, DIC, SIDBI, TIIIC NSIC,MSME- Objectives, Programmes, Financial Assistance,

## **UNIT V Women Entrepreneurship**

Concept of women entrepreneurship - Reasons for growth of woman entrepreneurship - Problems faced by them and remedial measures.

### **RELATED EXPERIENCE**

1. Case study of successive entrepreneurs
2. Visit to SIDCO
3. Visit to DIC
4. Visit to MSME centers

### **TEXTBOOKS**

1. Michael H Morris, Corporate Entrepreneurship and Innovation in Corporations, 7th Edition, CENGAGE Learning, Delhi, 2010
2. Jerry Katz, Entrepreneurship Small Business, 5th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.

### **REFERENCES**

1. Khanka S.S., Entrepreneurial Development, 1st edition, S.Chand and Company Limited, New Delhi, 2013.
2. Prasama Chandra, Projects: Planning, Analysis, Selection, Implementation and Reviews, 2nd edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1996.
3. Robert D. Hisrich, Entrepreneurship, 10th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

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1. <http://www.simplynotes.in/e-notes/mbabba/entrepreneurship-development/>
2. [https://www.iare.ac.in/sites/default/files/lecture\\_notes/IARE\\_Entrepreneurial\\_Development\\_NOTES.pdf](https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_Entrepreneurial_Development_NOTES.pdf)
3. <https://www.dynamictutorialsandservices.org/2018/10/entrepreneurship-development-notes.html>
4. <http://www.gplohaghat.org.in/download/file/oG6FoOTS2G.pdf>
5. <https://www.pasc.edu.in/wp-content/uploads/2021/04/ENTREPRENEURSHIP-DEVELOPMENT-III-BBA.pdf>

## COMPUTER APPLICATIONS IN FOOD INDUSTRY

Code:21FPRV0536

Credit: 3

Hours/ week: 3

Marks: 100

### Course Objectives:

- To impart knowledge related to the applications of computation in food industries
- To expose the students with fundamental knowledge on the computer software

### Learning Outcome:

Students will gain knowledge regarding the computer applications and how to use the applications in food industry.

### UNIT I

Importance of computerization in food industry, operating environments and information systems for various types of food industries, principles of communication

### UNIT II

Supervisory Control and Data Acquisition (SCADA): Introduction to SCADA, SCADA systems hardware and firmware, SCADA systems software and protocols, landlines, local area network systems, modems, central site computer facilities

### UNIT III

Web hosting and Webpage Design: Domain registration, web hosting, webpage design using web publishing software; Introduction to File Transfer Protocol (FTP); Online food process control from centralized server system in processing plant

### UNIT IV

Introduction to CFD Applications in Food Industry: Introduction to Computational Fluid Dynamics (CFD), governing equations of fluid dynamics. Models of flow, substantial derivative, divergence of velocity, continuity, momentum and energy equations. Physical boundary conditions, discretization. Applications of CFD in Food and beverage industry. Introduction to CFD softwares, GAMBIT and Fluent softwares

### UNIT V

Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data, Exploratory data analysis.

### REFERENCE:

Chary SN (2004), Production and Operations Management, Tata Mc Graw Hill III Edition.

Anil Kumar, S and Suresh, N (2009), Operations Management, New Age International (P) Ltd., Publishers, New Delhi

Slack, N, Chambers, S and Jhonston, R (2007) Operations Management, Pearson Education Ltd., Essex, UK

Joseph G. Monks(1997), Operations Management Theory and Problems, Mc. Graw Hill III Edition

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<https://electricalfundablog.com/scada-system-components-architecture/>  
<https://www.automationit.com/blog/73-5-ways-scada-can-improve-food-and-beverage-manufacturing>  
<https://www.slideshare.net/PraveenKumar3664/introduction-to-scada-123955975>  
<https://www.slideshare.net/malдитangpinay/basic-lecture-on-domains-and-webhosting>  
<https://www.slideshare.net/respected/web-hosting-32614653>  
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## **POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES (P)**

**Code: 21FPRV0537**

**Credit: 3**

**Contact Hours/week:3**

**Marks:100**

### **Course Objectives:**

- To understand the changes in of fruits and vegetables during maturity, ripening and storage
- To know about the post harvest management systems for fruits and vegetables
- To familiar with quality indices for fruits and vegetable selection and harvest

### **Specific learning outcome:**

After the completion of this course, the students will be able to,

- Describe the quality changes in fruits and vegetables after harvest
- Select appropriate methods to control the loss of quality in fruits and vegetables during handling, transport and storage
- Apply the knowledge to extend the shelf life of fruits and vegetables

### **UNIT I Overview of production and processing scenario**

Production of fruits and vegetables in India and world. Post harvest losses of fruits and vegetables, control of losses in harvesting and handling operations. Scope of fruit and vegetable processing industry Present status, constraints and prospects.

### **UNIT II Pre- harvest changes in fruits and vegetables**

Maturity indices for fruits and vegetables, composition and nutritive value changes of important fruits and vegetables. Physiology of respiration. Factors affecting rate of respiration.

### **UNIT III Fruit and vegetable ripening**

Biosynthesis of ethylene- its regulation and action on harvested fruits. Role of ethylene in fruit ripening. Various controlling agents used to regulate ethylene action. Ripening process; Fruit maturation and ripening. Physiological changes occurring during ripening of fleshy fruits. Climacteric and non-climacteric fruits.

### **UNIT IV Post harvest changes in fruits and vegetables**

Method of harvesting, tools used for harvesting, perishable and non-perishable crops, Loss of water from harvested horticultural crops. Changes in colour, texture and flavour after harvest and the factors influencing it.

## **UNIT V Storage of fruits and vegetables**

Storage systems for fruits for fruits and vegetables; Types of storage; zero energy cool chamber, low temperature storage, hypobaric storage, modified atmospheric storage, controlled atmospheric storage.

### **Practical**

1. Determine maturing indices of selected fruits and vegetables
2. Demonstrate harvesting method and the tools used for harvesting
3. Effect of precooling on shelf life of fruits and vegetables
4. Influence of pre treatments on selected fruits and vegetables quality
5. Determination of TSS and acidity of fruits
6. Test the quality of fruits subjected to chemical ripening process
7. Prepackaging of fruits and evaluation of its quality
8. Prepackaging of vegetables and evaluation of its quality
9. Visit to commercial packaging unit
10. Visit to commercial storage unit

### **TEXTBOOKS**

1. Thompson AK. 1995. Post Harvest Technology of Fruits and Vegetables. Blackwell Sci.
2. Kadar AA. 1992. Post-harvest Technology of Horticultural Crops. 2nd Ed. University of California.
3. Lloyd, A. & Penizer, R (1998). Handling, transportation and storage of fruits and vegetables, AVI Publications
4. Verma LR. & Joshi VK. 2000. Post Harvest Technology of Fruits and Vegetables. Indus Publ.

### **REFERENCES**

1. Pantastico B. 1975. Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI Publ.
2. Salunkhe DK, Bolia HR & Reddy NR. 1991. Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables. CRC.
3. Wills, R.B. (2002). Post harvest: An Introduction to the physiology and handling of fruits and vegetables, CBS Publishers & Distributors, New Delhi.
4. Verma, L.R., & Joshi, V.K. (2004). Post harvest technology of fruits and vegetables handling, processing, fermentation and waste management, Indus Publishing Co. New Delhi.

## WEBOGRAPHY

1. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5816>
2. <https://www.slideshare.net/KarlLouisseObispo/lecture-1-importance-of-postharvest-technology>
3. <http://www.fao.org/3/au186e/au186e.pdf>
4. <https://www.wnc.edu/files/departments/ce/sci/postharvesthandling.pdf>
5. <https://www.destechpub.com/wp-content/uploads/2015/01/Post-harvest-Technologies-of-Fruits-Vegetables-preview.pdf>
6. <http://www.fao.org/3/y4358e/y4358e05.htm>



## **FRUITS AND VEGETABLES PROCESSING(T)**

**Code:21FPRV0538    Credit: 3    Contact Hours/ Week:3    Marks:100**

### **Course Objectives:**

- To highlight the importance of fruit and vegetable processing
- To understand the changes in quality of fruits and vegetables during processing and storage
- To provide knowledge on technology of preservation and value addition of fruits and vegetables

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- know the post harvest management systems for fruits and vegetables
- familiar with various methods of preservation
- to improve the shelf life of fruits and vegetables
- process and produce value added products from fruits and vegetables

### **UNIT I Scenario of fruit and vegetable processing**

An over view of production and processing scenario of fruits and vegetables in India and World. Post harvest management of fruits and vegetables-control of losses in harvesting, and handling operations. Scope of fruit and vegetable preservation industry in India. Present status, constraints and prospects.

### **UNIT II Primary processing of fruits and vegetables**

Selection, cleaning, washing, peeling, cutting/slicing, grading, packaging of fruits and vegetables, processing methods, machinery used for the process, advantages and limitations of the processes.

### **UNIT III Beverages from fruits and vegetables**

Fruit beverages: fermented/non-fermented, processing technology for manufacturing of fruit juices, pulp, RTS beverage, nectars, squash, syrups, cordials, Carbonated. Fermented fruits and vegetables products like sauerkraut, pickles, wines etc.

### **UNIT IV Value added fruits and vegetable products**

Commercial processing of major fruits and vegetables (canning, jam, jellies, marmalade, purees, concentrates, preserve, candy, toffee/bar etc.). Drying and dehydration technology of fruits and vegetables: preparation of raisins, anardana, dried fig, dried leafy vegetables, juice powders, flakes, wafers, chips etc. Tomato paste, ketchup, sauce, puree, soup, chutney etc.

## UNIT V By-products utilization and waste management

Utilization of By-products: pectin extraction, vinegar production from fruit and vegetable waste, Waste disposal: Physical, Chemical & Biological methods; Economical aspects of waste treatment and disposal.

### TEXTBOOKS:

1. Srivastava, R.P. and Kumar, S.: Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co. Lucknow (2nd Edition 1998).
2. Girdharilal and Siddappa, Preservation of Fruits and Vegetables, Kalyani Publishers, 2001.
3. Subalakshmi, G and Udipi, SA: Food processing and preservation, 1st Ed. New Age International (P) Ltd. 2006

### REFERENCES:

1. Cruces, W.V. Commercial fruits and Vegetable products, Agrobios Publishers, 2009
2. Desrosier NW and Desrosier JN: The Technology Of Food Preservation, 4th Ed. CBS Publishers and Distributors, New Delhi. 2006

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1. <https://www.foodtown.com/articles/select-fresh-fruits-vegetables>
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111423>
3. [http://wiki.zero-emissions.at/index.php/Peeling\\_in\\_food\\_industry](http://wiki.zero-emissions.at/index.php/Peeling_in_food_industry)
4. [http://www.agritech.tnau.ac.in/postharvest/fpo\\_spec.html](http://www.agritech.tnau.ac.in/postharvest/fpo_spec.html)
5. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=5858>
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7. <http://www.madehow.com/Volume-4/Raisins.html#ixzz6d7LmmHcC>
8. [http://www.phdmsme.in/uploaded\\_files/project\\_report/1536148322\\_327.pdf](http://www.phdmsme.in/uploaded_files/project_report/1536148322_327.pdf)
9. <https://medium.com/@luolaner521/several-methods-of-making-dried-figs-cea083e2d01>
10. <http://www.ticomachine.com/faq/fruit-juice-powder-production.html>
11. <https://www.dimasharif.com/fruit-wafers/>
12. <https://onlinelibrary.wiley.com/doi/10.1111/1541-4337.12330>
13. <https://www.intechopen.com/books/pectins-extraction-purification-characterization-and-applications/extraction-and-purification-of-pectin-from-agro-industrial-wastes>
14. <https://www.environmentalpollution.in/waste-management/hazardous-waste/how-to-treat-hazardous-waste-physical-chemical-and-biological-treatment/6741>  
[slideshare.net/mujahidhussain63/physical-methods-of-waste-disposal-mujahid-hussain-12](https://www.slideshare.net/mujahidhussain63/physical-methods-of-waste-disposal-mujahid-hussain-12)

## FRUITS AND VEGETABLES PROCESSING PRACTICAL

Code:21FPRV0539

Credit: 4 Contact Hours:4 Marks:100

### Course Objectives:

- To understand the technology for preservation of fruits and vegetables
- To provide knowledge about quality testing of fruits and vegetables.

### Specific Learning Outcomes:

After completion of this course, the students will be able

- to know the different types of processed fruits & vegetables products.
- make different processed fruit & vegetable based products with quality assurance and safety.

### Practical

1. Peeling and cutting of fruits and vegetables
2. Extraction and preservation of Fruit Juices.
3. Testing Pectin in fruit juices and pulp.
4. Preparation of fruit RTS beverage and evaluation of its quality
5. Preparation of fruit squash and cordial.
6. Preparation of fruit jam and evaluation of its quality
7. Preparation of fruit jelly/marmalade
8. Preparation of fruit preserve and candy
9. Preparation of fruit bar/toffee
10. Preparation of dehydrated fruits and vegetables
11. Preparation of pickle/ mixed pickle
12. Preparation of tomato ketch-up, sauce & chutney
13. Visit to fruit processing industry
14. Visit to vegetable processing industry

## **DRYING TECHNOLOGY**

**Code:21FPRV0540**

**Credit: 3**

**Contact Hours/week:3**

**Marks:100**

### **Course Objectives:**

- To understand the concept and principle of food drying
- To provide knowledge about machineries used for drying/dehydration of foods.
- To highlight the factors influencing drying/dehydration of foods

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- know the characteristics and properties of dehydrated foods familiar
- with various methods of drying to improve the shelf life Apply the
- knowledge to fabricate/manufacture dehydrated food products

### **UNIT I Basics of Dehydration**

Drying meaning, Principles of drying, Theories of drying, Water content in foods and its determination, difference between drying and dehydration, conventional and modern methods of drying, advantages and limitations of sun/solar drying, characteristics of dried products and its quality.

### **UNIT II Mechanical drying**

Fundamentals of cabinet drying, Mass and Heat balances in dryers (batch and continuous) (simple problems only), description of batch and continuous dryers, Vacuum and Drum driers, Application in Food industry.

### **UNIT III Spray Drying of Foods**

Fundamentals, Nozzles, Rotary atomizers and two fluid feeds, Interaction of droplets with air, Drying of droplets with soluble and insoluble solids, Microstructure of spray dried products, Reconstitution, Foam spray drying, Applications in the Food industry.

### **UNIT IV Freeze Drying of Foods**

Fundamentals of freeze drying, Freezing and drying steps, Structural changes and volatile retention during freeze drying, Freeze dehydration related processes:                   prefreezing, preconcentration, condensation, defrosting, Industrial freeze driers, Atmospheric freeze drying, Applications in food industry

### **UNIT V Other Drying Methods**

Fluidised bed drying, Batch and Continuous dryers, Pneumatic dryer, tunnel drier, kiln drier, microwave drying principle, process and practice, Advantages and limitations, Applications in food industry.

## **Practical**

1. Preparation of sun dried vegetable products and evaluation of its quality
2. Preparation of dehydrated vegetable products using solar drier and evaluation of its quality
3. Preparation of dehydrated fruit products using cabinet drier and evaluation of its quality
4. Preparation of dehydrated fruit products by osmotic dehydration
5. Preparation of fruit juice powders by spray drying
6. Preparation of freeze dried products and evaluation of its quality
7. Preparation of dehydrated vegetable products by using microwaves
8. Visit to fruit juice powdering unit
9. Visit to vegetable dehydration unit
10. Visit to grain drying unit

## **TEXTBOOKS**

1. Desoresier, W.N. and James, N. (1987). "The Technology of Food Preservation". New Delhi: CBS Publishers and Distributors.
2. Girdharilal, G.S. and Siddappa (1986). "Preservation of Fruits and Vegetables". New Delhi: Publications and Information Division, ICAR.
3. Subalakshmi, G and Udipi, S.A. (2001), "Food processing and preservation". New Age International Publishers, New Delhi.
4. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.

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1. Gould, G. W. (2012), "New Methods of food preservation", Springer Science & Business Media.
2. Arun S. Mujumdar (2006), "Handbook of Industrial Drying", 3rd Edition, CHIPS (2006)

## **WEBOGRAPHY**

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4. <https://www-researchgate-net.cdn.ampproject.org/v/s/www.researchgate.net/figure/Advantages-and-disadvantages-of-the-four-types-of-solar-food->

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## **NOVEL FOOD PROCESSING TECHNOLOGIES**

**Code:21FPRV0541    Credit: 3    Contact Hours/week:3    Marks:100**

### **Course Objectives:**

- To know about new developments in food processing
- To provide knowledge about concept and principles of novel techniques
- To highlight the applications in food processing

### **Specific Learning Outcomes:**

After completion of this course, the students will be able to

- know the application and use of the technology in food processing
- explain the concepts and process involved in novel food processing
- Apply the knowledge to develop/modify food products

### **UNIT I Food Irradiation**

Irradiation: meaning, source, principle- types of irradiation, process, advantages, limitations, Food applications

### **UNIT II Membrane separation process**

Membrane Technology-process, types: Micro-filtration, Ultra-filtration, Nano-filtration and Reverse Osmosis-advantages and limitations, Food applications

### **UNIT III High pressure processing**

High Pressure processing: Concept-Equipment for HPP Treatment-Mechanism of Microbial Inactivation and its Application in Food

### **UNIT IV Hurdle technology**

Basics of hurdle technology Mechanism, Newer Chemical and Biochemical hurdles- organic acids – Plant derived antimicrobials – Antimicrobial enzymes – bacteriocins – chitin / chitosan, Advantages and limitations

### **UNIT V Genetically Modified foods and functional foods**

GMO meaning, principle and application, advantages and limitations; functional foods meaning and the concepts, advantages and limitations.

## TEXTBOOKS

1. Da-Wen Sun, "Emerging Technologies for Food Processing", Academic press/ Elsevier, London, UK, 2005.

## REFERENCES

1. Leistner L. and Gould G. Hurdle Technologies – Combination treatments for food stability safety and quality, Kluwer Academics / Plenum Publishers, New York (2002)
2. P Richardson, "Thermal Technologies in Food Processing", Campden and Chorleywood Food Research Association, UK, Woodhead Publishing Limited 2001
3. Gustavo V.Barbosa-Canovas, Maria S.Tapia and M.Pilar Cano, " Novel Food Processing Technologies". CRC Press, 2004.

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2. [https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-V\\_8.pdf](https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-V_8.pdf)
3. [http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp\\_content/S000015FT/P000068/M000148/ET/14616619928et.pdf](http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000015FT/P000068/M000148/ET/14616619928et.pdf)
4. <https://www.ijcmas.com/vol-4-7/Aditya%20Pundhir%20and%20Nida%20Murtaza.pdf>



## **SEMESTER VI**

### **FOOD HYGIENE AND SAFETY**

**Code:21FPRV0643    Credit:3    Contact Hours/week3    Marks:100**

#### **Course Objectives:**

- To understand the hygienic practices in food industry.
- To maintain personal hygiene and to check food safety aspects.

#### **UNIT I Food Safety**

Definition, principles of food safety, need and importance of food safety in food industries; Factors affecting food safety; source of contamination, food borne diseases, test for food safety.

#### **UNIT II Hygiene Practices and sanitation in food industry**

Introduction, necessity, personnel hygiene, sanitary practices, management and sanitation, safety at work place. Importance of sanitation, application of sanitation to food industry, microorganism control and microbial growth.

#### **UNIT III Hygiene and food handling**

Purchasing and receiving safe food, food storage, sanitary procedures in food preparation, serving and displaying of food, special food operations.

#### **UNIT IV Environmental Sanitation**

Location and layout of premises, constructional details, sanitary requirements for equipments, guidelines for cleaning equipments, cleaning procedures, pest control, water supply, storage and waste disposal, environmental pollution.

#### **UNIT V Sanitation regulations and Standards**

Introduction, regulatory agencies, control of food quality, local health authority. Food sanitation check lists given by FSSAI.

## **TEXTBOOKS:**

1. Roday S, (2011) (2002), “Food Hygiene and Sanitation”, McGraw Hill Publishing Company Limited.
2. H. L. M. Lelieveld, John Holah, David Napper, (2014), “Hygiene in Food Processing: Principles and Practice”, Elsevier Publications.

## **REFERENCES:**

1. Marriott, Norman (2013), “Principles of Food Sanitation”, Springer Science & Business Media Publishing.

## **WEBOGRAPHY**

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2. <https://www.unimed.edu.ng/oer.unimed.edu.ng/LECTURE%20NOTES/1/1/SUNDA Y-OLANREWAJU-Basics-of-food-safety-and-HygieneOER1037206.pdf>
3. <https://www.slideshare.net/AbiodunOladipo/food-hygiene-and-safety-lecture>
4. [https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture\\_notes/env\\_health\\_science\\_students/foodhygieneptii.pdf](https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/foodhygieneptii.pdf)
5. [https://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Exporting\\_Better/Quality\\_Management/AssetPDF/FINAL%20Food%20safety%20and%20GHP%20-%20Gambia\(2\).pdf](https://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Exporting_Better/Quality_Management/AssetPDF/FINAL%20Food%20safety%20and%20GHP%20-%20Gambia(2).pdf)
6. <https://www.scribd.com/presentation/479849314/Food-Hygiene-Lecture-ppt>

## FOOD PLANT MAINTENANCE AND MANAGEMENT

**Code:21FPRV0644   Credit: 4   Contact Hours/week:4   Marks:100**

### **Course Objectives:**

- To understand the importance of plant maintenance in quality control
- To provide knowledge about food hygiene, sanitation and safety in unit operations
- To highlight the significance of cleanliness in quality management

### **Specific Learning Objectives:**

After completion of this course, the students will be able to

- Outline the pitfalls in maintaining hygienic conditions in the food plant
- Know causes of contamination/pollution in the food plant
- Describe the methods to be followed to control/prevent contamination in food plant

### **UNIT I Plant Maintenance**

Plant maintenance program; Role of maintenance staff and plant operators; Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants.

### **UNIT II Plant Safety**

The objective of safety, health & environment; Cost of safety; Accident investigation report; Safety promotional activity; Environmental pollution and its control.

### **UNIT III Plant Hygiene**

Hygiene and sanitation requirement in food processing industries; Cleaning, sanitizing & pest control in food processing; storage and service areas.

### **UNIT IV Plant Sanitation**

Basic principles and problems, cleaning and sterilizing agents, methods of sterilization, methods of cleaning, choice of cleaning methods, introduction to special cleaning methods.

## UNIT V Plant Utilities

Indian Factories Act on safety; HACCP; Desirable safety features of some food processing equipment; Personal protective equipment; Safety from adulteration of food.

### TEXTBOOKS

1. Michael M. Cramer (2006). Food Plant Sanitation: design, maintenance, and good manufacturing practices, CRC Press, ISBN: 0849341973, 9780849341977.

### REFERENCES:

1. Zacharias B. Maroulis, George D. Saravacos, (2007), "Food Plant Economics", CRC Press Publishers.
2. George D Saravacos, A. E. Kostaropoulos. (2002). Handbook of Food Processing Equipment, Food engineering series by Springer.

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2. <https://www.highspeedtraining.co.uk/hub/riddor-reporting-accident-at-work/>
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7. [https://ubblab.weebly.com/uploads/4/7/4/6/47469791/principles\\_of\\_food\\_sanitation\\_5th\\_ed.pdf](https://ubblab.weebly.com/uploads/4/7/4/6/47469791/principles_of_food_sanitation_5th_ed.pdf)
8. <https://www.slideshare.net/GautamKumar143/special-cleaningprogram>
9. <https://www.respiratorshop.co.uk/blog/selecting-the-right-ppe-for-food-process-industry>
10. <https://www.mpofcinci.com/blog/guide-to-sanitary-and-hygienic-design/>

## PROJECT PREPARATION AND MANAGEMENT

**Code:21FPRV0645**

**Credit:4**

**Contact Hours/week:4**

**Marks:100**

### **Course Objectives:**

- To understand the basic concepts of project management.
- To provide knowledge on business proposals preparation
- To highlight the importance of planning and evaluation of project.

### **Specific Learning Outcomes**

After completion of this course, the students will be able to

- Familiar with the steps in project management.
- Know the basics in preparation of effective proposals.
- Evaluate the technical feasibility, financial viability, market acceptability and social desirability of projects.

### **UNIT I Introduction to Project Management**

Projects - Project ideas and preliminary screening. Developments - Project planning to Project completion - Pre-investment phase, Investment phase, operational phase - Governmental Regulatory framework. Capital Budgeting.

### **UNIT II Stages of Project Management**

Opportunity studies - prefeasibility studies, functional studies or support studies, feasibility study expansion projects, data for feasibility study. Market and Demand analysis, Market Survey, Demand forecasting. Technical analysis- Materials and inputs, Choice of Technology, Product mix, Plant location, capacity, Machinery and equipment.

### **UNIT III Appraisal Process**

Concepts. Time value of money - Present and future value. Appraisal criteria - Urgency, Payback period, Rate of return, Debt service coverage ratio, Net present value, Benefit cost ratio, Internal rate of return, Annual capital charge, Investment appraisal in practice.

## **UNIT IV Risk and Profitability Analysis**

Risk analysis- Measures of risk, Sensitivity analysis, and Decision tree analysis. Means of financing, Term Loans, Financial Institutions. Cost of capital. Profitability - Cost of Production, Break-even analysis. Assessing the tax burden and financial projections.

## **UNIT V Project Planning, Implementation, And Control**

Forms of Project Organization, Project Planning, Implementation, and Control – Network construction, CPM, PERT, Development of Project schedule, Crashing of Project Network. Introduction to Foreign collaboration projects - Governmental policy framework, Need for foreign technology, Royalty payments, Foreign investments and procedural aspects.

### **TEXTBOOKS:**

1. M.R. Gopalan, (2015). Project Management Core Textbook,(Paper Back) 2<sup>nd</sup> edition, Wiley India.
2. Gary Heerkens (2013). Project Management, Second Edition, Mc. Graw Hill Education, 2013.

### **REFERENCES:**

1. Prasanna Chandra, (2014). Projects: Planning, Analysis, Selection, Financing, Implementation, 8<sup>th</sup> Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. P.Gopalakrishnan and V.E.RamaMoorthy (2014). Text Book of Project Management, 1<sup>st</sup> Edition, Macmillan India Ltd., New Delhi.
3. John M. Nicholas, Herman Steyn, (2016). Project Management for Engineering, Business and Technology, 5<sup>th</sup> Edition, Routledge.

## WEBOGRAPHY

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2. <https://kissflow.com/project/five-phases-of-project-management/>
3. <https://www.lucidchart.com/blog/the-4-phases-of-the-project-management-life-cycle>
4. <https://blog.arkieva.com/demand-forecasting/>
5. <https://twproject.com/blog/project-organizational-structures-project-management/>
6. <https://bbamantra.com/market-and-demand-analysis/>

## FOOD PRODUCT DEVELOPMENT

Code:21FPRV0647

Credit: 2

Hours:2

Marks:50

### Course Objectives:

- To acquire knowledge on the importance of consumer research, finance and communication.
- To understand various aspects of food product development

### Learning Outcome:

- To understand and know various aspects of food product development underlying food science and technology and consumer research.
- They may be able to appraise the features and trends of specific food product within an appropriate market settings

### UNIT I

New food Products development, Factors influencing product development, consumer- oriented product development, Impact of technology and Market place influence.

### UNIT II

How to develop a new product?. Phases in product development. Statistical experimental methods. Modelling for process and recipe.

### UNIT III

Refining the screening procedure for the products, Sensory Evaluation, Shelf-life testing, Product integrity and conformance to standards. Test Marketing; evaluating results and analysing. Packaging, design graphic and labelling.

### UNIT IV

Value addition in plant foods- Garlic, Ginger, Dragon fruit, Bitter Gourd, Lichi, Moringa, Coconut, Mushroom, Seaweed and related innovative approaches in foods.

Vegan Yoghurt- Oat Milk Yoghurt, almond milk yoghurt, coconut milk yoghurt, soy based and hemp yoghurt. Kefir, Container milk, Fudge.

### UNIT V

Value addition in animal foods – Goat Milk, Cheese, Butter, Ice Cream, Yoghurt.

Value added meat and poultry products: Chicken nuggets, Sausages, Patties, Quail meat products, Processing and preservation techniques.

### REFERENCE:

Fuller G.W. (1994). New Food Product Development: From Concept to Market Place, New York, CRC Press.

Man C.M.D and James A.A. (1994). Shelf-life Evaluation of Foods. London: Blackie Academic and Professional.

Olickle J.K. (1990). New Product Development and Value added. Canada: Food Development Division Agriculture.

International Journal of Food Science and Technology



## **ELECTIVE PAPERS**

### **ELECTIVE -1**

#### **FUNCTIONAL FOODS AND NUTRACEUTICALS**

**Code: 21FPRV05E1**

**Hours/week: 3**

**Credits: 3**

**Marks:100**

#### **Course Objectives**

To enable the students

To Understand the basics of functional foods and nutraceuticals

To study the significance of nutraceuticals

To identify new strategies for marketing of traditionally known nutraceuticals

#### **UNIT I**

Functional Foods - Historical Perspective, Definition, Classification based on the sources  
– Animal, Plant and Microbial, Health benefits

Nutraceuticals – Definition, Classification Based on Food sources – Animal, Plant and Microbial, Health benefits

#### **UNIT II**

Phytochemicals – Classification – Nutrients, Herbals, Dietary Supplements; Sources, Effect of Processing.  
Development of designed foods – Herbal supplements and Dietary Supplements

#### **UNIT III**

Prebiotics: Definition, Characteristics of prebiotic micro-organisms, Sources; Prebiotic food products - Natural and Processed; Guidelines of Prebiotic Safety

Probiotics: Definition, Characteristics of prebiotic micro-organisms, Sources; Probiotic food products - Natural and Processed; Guidelines of Probiotic Safety

Postbiotics: Definition, Characteristics of prebiotic micro-organisms, Sources; Probiotic food products - Natural and Processed; Guidelines of Probiotic Safety

## UNIT IV

Functional Ingredients – Extraction / Purification of lycopene, iso flavonoids, prebiotics, probiotics, glucosamine and phytosterols. Manufacturing of dietary supplements in the form of liquid, rehydration powder and mix.

## UNIT V

Enrichment and Fortification in different foods – Dairy Products, Beverages, Protein mixes, Infant Formulas, Value addition in different processed food products.

## REFERENCE

1. Robert E.C Wildman. Handbook of Nutraceuticals and Functional Foods, CRC Press 2. Bagchi. D, Preuss. H. G and Swaroop. A (2016). Nutraceuticals and Functional Foods in human health and disease Prevention. Taylor and Francis Group.
  - Lockwood B (2007), Nutraceuticals – A Guide for healthcare professionals, second edition, Pharmaceutical Press.
  - Johnson I and Williamson G (2003), Phytochemical functional foods, CRC Press, Boca Raton, Boston, New York, Washington, DC.
  - Nutraceutical and Functional Food Components, Charis Galanakis, Academic Press
  - Functional Foods and Nutraceuticals (Food Science Text Series), Rotimi E. Aluko, Springer; 2012 edition
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- <https://www.cambridge.org/core/services/aop-cambridge-core/content/view/S0007114502002337#:~:text=The%20concept%20of%20functiona%20foods,associated%20with%20specific%20health%20benefits.>
- <https://pubmed.ncbi.nlm.nih.gov/17323283/>
- [https://www.researchgate.net/publication/343846825\\_Nutraceuticals\\_History\\_Classification\\_and\\_Market\\_Demand](https://www.researchgate.net/publication/343846825_Nutraceuticals_History_Classification_and_Market_Demand)
- <https://pubmed.ncbi.nlm.nih.gov/12738185/#:~:text=The%20term%20functional%20ingredient%20is,drugs%2C%20nutrients%20and%20food%20additives.>
- <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-distinguishing-liquid-dietary-supplements-beverage>

## ELECTIVE – 2

### TECHNOLOGY OF SEA FOOD PROCESSING

**Code: 21FPRV05E2**

**Credits: T3+P0**

**Hours/week:3**

**Marks: 100**

#### Course Objectives

- To know the importance of fishery industry.
- To know the compositional technological aspects of fish.
- To study processed fish product.

#### UNIT I

Introduction to Sea food processing - Chilling and Freezing of fish  
Status of fishery industry in India.

Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems, (air, blast freezing, plate or contact freezing spray or immersion freezing) freezing on board, onshore processing changes in quality in chill and frozen storage and thawing.

#### UNIT II Fish Curing

Drying and salting of fish, water activity and self- life. Salting processes, salting methods (brining, pickling, kench curing, gasp curing). Types of salts, dried and salted fish products. Pindang, fish wood, dried shrimp.

#### UNIT III Smoking

Smoking- smoke production, smoke components quality, safety and nutritive value of smoked fish. Processing and equipment, pre-smoking process, smoking process control, traditional chimney kiln, modern mechanical fish smoking kiln.

Examples of smoked and dried products.

#### UNIT IV Canning of Fish

Principles of canning, classification of PH groupings, effect of heat processing on fish, storage of canned fish. pre-processes operations, cannery operations for specific canned products( Tuna, Sackerel, Sardines) .

#### UNIT V Fishery By-products

Fish protein concentrates (FPC), Fish protein entrets (FPE), Fish protein Hydrolysis (FPH), Fermented fish sauce and paste.

Crabs, prawns, Lobsters, shrimps, shell fish products.

#### RELATED EXPERIENCES

1. Visit to sea food processing units.

## RELATED REFERENCE BOOKS

Hall GM, Fish processing technology, VCH publishers INC.NY.1992.

Sen DP, Advances in fish processing technology, allied publishers pvt ltd.2005.

Shahidi F, Botta. JR, sea foods ,chemistry, processing technology and quality, blackie academic & professional London,1994.

## WEBOGRAPHY

[https://www.researchgate.net/publication/339788847\\_An\\_Introduction\\_to\\_Seafood\\_and\\_Recent\\_Advances\\_in\\_the\\_Processing\\_of\\_Seafood\\_Products#:~:text=Seafood%20is%20one%20of%20the,rich%20fish%2C%20molluscs%20and%20crustaceans.](https://www.researchgate.net/publication/339788847_An_Introduction_to_Seafood_and_Recent_Advances_in_the_Processing_of_Seafood_Products#:~:text=Seafood%20is%20one%20of%20the,rich%20fish%2C%20molluscs%20and%20crustaceans.)

<http://www.fao.org/3/Y5013E/y5013e04.htm>

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<https://www.sciencedirect.com/topics/food-science/canned-fish#:~:text=Canning%20is%20one%20of%20the,temperature%20for%20a%20determined%20time.>

[https://agritech.tnau.ac.in/fishery/fish\\_byproducts.html#:~:text=The%20traditional%20fishery%20byproducts%20are,of%20fish%20and%20fish%20waste.](https://agritech.tnau.ac.in/fishery/fish_byproducts.html#:~:text=The%20traditional%20fishery%20byproducts%20are,of%20fish%20and%20fish%20waste.)

## ELECTIVE-3

### FOOD ENGINEERING

**Code:21FPRV05E3 Credits: T3+P0 Hours/week:3 Marks: 100**

#### Course Objectives:

- To understand the principles of unit operation.
- To acquaint with fundamentals of food engineering and its process.

To understand the basics of designing of food plant and systems

#### UNIT I Introduction

Concept of unit operation, units and dimensions, unit conversions, dimensional analysis, man and energy balance, related named.

#### UNIT II Design of Food Plant

Important considerations for designing of food plants, types of layout principles and equipment's, used in food industry.

#### UNIT III Phases of Liquid Mechanism

Liquid transport systems, properties of liquids, Newton's law of viscosity. Concepts and selection of refrigerant, description of a refrigeration cycle, frozen food storage. Heat and mass transfer, systems for heating and cooling food products, thermal properties of food, mode of heat transfer.

#### UNIT IV Steam, Evaporation and Dehydration

Generations of steam, design of single evaporators, Dehydration System design.

#### UNIT V Psychrometric

Properties of dry air, water vapour, Air vapour, mixture, psychrometric charts.

#### REFERENCE BOOK

Rao,DG,2010,Fundamentals of Engineering,P41kerning private,Ltd.

Singh RP and Heldman DR,1991,2003,2009,Introduction to food engineering, Academic press, 2nd,3rd and 4th edition.

Rao,CG,2006, Essentials of food processing engineering B.S publications. 4. Fellow P.1988, Food Processing Technology.

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<https://www.slideshare.net/mobile/mahmudulmithun/unit-operations-99244122>

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<http://ecoursesonline.iasri.res.in/course/view.php?id=529>

<https://www.slideshare.net/bhavik22/properties-of-fluids-47900406>

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