Semester	**:**	**II**		
Course No.	**:**	**SEC-APE-123**	**Credit Hrs.**	**: 4(0+4)**
Course Title	**:**	**Primary Processing and Value Addition and Cold Chain Logistics**		

Objectives :

(i) To understand the primary processing techniques for fruits and vegetables,

(ii) To learn the operation and maintenance of cold chain systems,

(iii) To explore cold chain technologies, cold transport logistics,

(iv) To study the supply chain management and logistics for food.

TEACHING SCHEDULE

PRACTICAL

Exercise No.	Exercise Title
1	Study the maturity indices of fruits and vegetables.
2	Study of different methods of fruits and vegetables cleaning.
3	Study the different methods of sorting and grading for fruits and vegetables.
4	Study the operation and maintenance of washers and graders.
5	Study the waxing treatment and its role in extending shelf life of fruits and vegetables.
6	Study the different types of peelers and slicer.
7	Study the different methods of blanching for processing of fruits and vegetables.
8	Study of juicer and pulper for fruits and vegetables.
9	Study the different methods of filtrations for fruit and vegetable juices.
10	Study of commonly used packaging materials for fresh fruits and vegetables.
11	Demonstration of shrink-wrapping packaging techniques for fruits and vegetables.
12	Demonstration of vacuum packaging techniques for fruits and vegetables.
13	Study of modified atmosphere packaging on the quality of fresh produce.
14	Study of controlled atmosphere storage on the quality of fresh produce.
15	Study the aseptic packaging used for pulp and juice.
16	To study the working principles and components of a vapour compression refrigeration system.
17	Study of domestic household refrigeration system.
18	To study the working principles and components of a vapour absorption refrigeration system.
19	Assessment of refrigerants based on environmental and thermodynamic properties.

Continued…

20	Measurement of energy consumption and coefficient of performance (cop) in refrigeration systems.
21	Study of psychometric chart and various psychometric processes.
22	Study on repair and maintenance on refrigeration system.
23	To study the freezing methods and equipments.
24	To study the various precooling methods for fruits and vegetables.
25	Survey of existing precooling facilities in local agricultural markets.
26	Identification of suitable precooling methods for different horticultural crops.
27	Study the cold storage for fruits and vegetables.
28	Design of cold storage.
29	Assessment of energy efficiency in cold storage systems.
30	Study the solar-powered cold storage systems for fruits and vegetables.
31	Assessment of energy efficiency in solar-powered cold storage systems.
32	Application of IoT sensors for monitoring and controlling cold storage conditions.
33	Preparation of a maintenance checklist for efficient cold storage operations.
34	Study of the operational parameters of ripening chambers for optimal fruit ripening.
35	Measurement of ethylene gas concentration and its impact on fruit ripening.
36	Study of low-cost ripening chamber for different fruits.
37	Survey of ripening chamber technology usage in local fruit processing units.
38	Identification of factors affecting the performance of semi-chilled transport systems for food products.
39	Assessment of temperature and relative humidity fluctuations in refrigerated van systems during long-distance transport.
40-41	Measurement of energy consumption in different cold transport systems (Chilled vs. Semi-chilled vans).
42	Estimation of the shelf life of perishable goods during transport using refrigerated vans.
43-44	Survey of cold chain logistics in the food industry: challenges and best practices.
45	To study the effectiveness of gel pack as a cooling agent in cold chain transportation.
46	Identification of temperature variations in cold chain systems using dry ice and liquid nitrogen.
47	Standards and regulations for cold chain management system.

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48-49	Preparation of a cold chain protocol for ensuring safe transport of food products.
50-51	Survey of cold chain infrastructure in the agricultural sector for fruits and vegetables.
52-53	Study of supply chain management systems in global industries: Planning, sourcing, manufacturing, delivering and returning.
54	Study the types of SCM models.
55	Assessment of inventory management systems in contract logistics.
56	Study the different preservation methods for extending the shelf life of fruits and vegetables and its products.
57	Study the beverages prepared from different fruits and vegetables.
58	Preparation of fruits and vegetables-based jams and jellies and their evaluation for quality parameters.
59-60	Studies on dehydration of fruits and vegetables using different drying techniques.
61	To develop novel food products from fruits and vegetables.
62	Visit to supply chain management logistic system for different agricultural commodities.
63	Visit to a Commercial precooling plant, Ripening chamber facility and Cold storage facility to understand operational challenges and solutions.
64	Visit to a Fruit and Vegetable Processing Plant to understand Post-harvest operations.

Suggested Readings: [SEC-APE-123]

1. Post Harvest Technology of Horticultural Crops by Dr. S.R.S.S. Chhabra (2017, ISBN: 978-9386408957)
2. Principles of Food Preservation by Dr. P.G. Rao (2004, ISBN: 978-8171414602)
3. Food Processing and Preservation by S.R.S. Chhabra (2015, ISBN: 978-9385567601)
4. Postharvest Management of Horticultural Crops by K.M.K. Usha Rani (2014, ISBN: 978-9350250177)
5. Cold Chain Management and Food Safety by P. G. A. S. R. Rao (2012, ISBN: 978-8175950513)
6. Packaging Technology for Horticultural Crops by D. S. S. R. D. R. Rao (2018, ISBN: 978-9380913300)
7. Food Refrigeration and Cold Storage by Rajeev Ranjan & R. C. Chaurasia (2011, ISBN: 978-8120335266)
8. Technology of Fruit and Vegetable Processing by R. S. Singhal (2007, ISBN: 978-8187072966)
9. Supply Chain Management in Food Industry by S. S. S. R. Rao (2016, ISBN: 978-9384058721)
10. Food Processing and Engineering by Shalini Puri (2008, ISBN: 978-8120338892).