

<b>5<sup>th</sup> Semester</b>	<b>RAG5D006</b>	<b>Post-Harvest Engineering of Horticultural Crops</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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**Module I (10 Hours)**

General introduction- Food supply chain, Importance of processing of fruits and vegetables, spices, condiments; Flowcharts for preparation of different finished products; properties of horticultural crops important for processing; Preservation Technology; Sorting, grading and equipment, Peeling methods and devices; Slicing of horticultural crops - Disintegration methods with little change of form; Disintegration methods with considerable change of form such as cutting, shredding, crushing, chopping, juice extraction, etc; equipment for slicing, shredding, crushing, chopping, juice extraction, etc;

**Module II (10 Hours)**

Blanching: Importance, objectives and blanching methods, effects on food (nutrition, colour, pigment, texture); Chilling and freezing: Application of refrigeration for perishable food products, thermophilic, mesophilic and psychrophilic micro-organisms, chilling requirements of different fruits and vegetables, freezing of food, freezing time calculations, slow and fast freezing; Chilling and freezing: Equipment for chilling and freezing (mechanical & cryogenic), refrigerated vehicle and cold chain system; evaporative cooled storage ; Dryers for fruits and vegetables, osmo-dehydration; Handling and transportation- fruits and vegetables, different modes of transportation ,Different types of conveyors and elevators, trucks (refrigerated/unrefrigerated), pneumatic transportation, water flumes

**Module III (10 Hours)**

Post-harvest management and equipment for spices such as ginger, turmeric and chilli; Pack house technology, Minimal processing; Packaging of horticultural commodities, Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, microorganisms, mechanical strength); Different types of packaging materials commonly used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines; Controlled atmospheric storage, Modified atmospheric packaging; Quality control in Fruit and vegetable processing industry. Importance, Present scenario, Requirement, HACCP system

**Module III (10 Hours)**

Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic and Psychrophilic micro-organisms, Chilling requirements (fruits and vegetables), Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical and cryogenic),

Effect on food during chilling and freezing, cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system; Dryers for fruits and vegetables, Osmo-dehydration; Handling and transportation of fruits and vegetables, Pack house technology, Minimal processing; Common methods of storage, Modified atmospheric packaging; Post harvest management and equipment for spices; Packaging of horticultural commodities.

### **Books**

1. Pandey, R.H. 1997. Post harvest Technology of fruits and vegetables (Principles and practices). Saroj Prakashan, Allahabad
2. Sudheer, K P. and Indira, V. 2007. Post Harvest Engineering of horticultural crops. New india Publishing House.
3. Lal Giridhari, Siddappa and Tondon. 2001. Preservation of fruits and vegetables. ICAR, New Delhi
4. Srivastava and Sanjeev Kumar. 2008. Fruit and vegetable preservation: principles and practices. Kalyani Publishers
5. Fellows, P. 2008. Food Processing Technology. Woodhead
6. The Role of Post-harvest Management in Assuring the Quality and Safety of Horticultural Crops, FAO, UNO
7. Mangaraj, S, Dash, S K, Swain S. and Ali, N. 2017. Agricultural Process Engineering Vol II (Post Harvest Unit Operations). Kalyani Publishers, New Delhi. 428 p.
8. Mangaraj, S, Ali, N. Swain S. and **Dash, S K** 2017. Agricultural Process Engineering Vol III (Storage Engineering and Technology). Kalyani Publishers, New Delhi. 348 p.

### **Digital Learning Resources**

1. [Modern Techniques for Agricultural Disease Management and Crop Yield Prediction](#)