

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment/Field visit report : 15 marks

SYLLABUS

Module 1 (11 hrs)

Functional requirements for storage of grains, physical and biochemical changes in stored commodities, post-harvest physiology of semi-perishables and perishables, climacteric and non-climacteric fruits, respiration, ripening, Damages and causes of spoilage in storage, destructive agents, sources of infestation and control.

Module 2 (10 hrs)

Classification and characteristics of storage structures; Silos: Horizontal silos, tower silos, pit silos, trench silos, size and capacity of silos; influence of ventilation on internal storage conditions, moisture and temperature variations in stored grains, techniques for maintaining suitable storage environments.

Module 3 (11 hrs)

Aeration and stored grain management, design and operation aeration system, Damage due to storage pests and its control, seed coating, and fumigation. Damage caused by rodents and its control, Storage of horticultural produce: cold storage, controlled and modified atmospheric storage, hypobaric storage and evaporative cooling storage, Control of temperature and relative humidity inside storage for quality retention.

Module 4 (10 hrs)

Design of storage structures: Functional and structural design of grain storage structures, grain pressure theories, Standards and codes related to storage construction, functional, structural and thermal design of cold stores.

Field visit

Field visit to grain warehouses and cold storage facilities to study the functional, structural, and thermal design of storage structures.

Text Books

1. Michael, A. M., & Ojha, T. P. (2004). *Principles of Agricultural Engineering, Volume I*. Jain Brothers.
2. Sahay, K. M., & Singh, K. K. (2009). *Unit Operations in Agricultural Processing*. Vikas Publishing House.

- Raghavan, G. S. V., Mujumdar, A. S., & Chakraverty, A. (2023). Postharvest technology of cereals, fruits, and vegetables: Storage, handling & processing (Revised ed.).

Reference Books

- Pandey, P. H. (2019). *Principles and Practices of Agricultural Structures and Environmental Control*. Kalyani Publishers.
- Angaraj, S., Dash, S. K., Swain, S., & Ali, N. (2021). *Agricultural Process Engineering, Volume II*. Kalyani Publishers.
- Sharma, H. K., & Kumar, N. (Eds.). (2022). *Agro-processing and food engineering: Operational and application aspects*. Springer Singapore.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER (STC 2025 SCHEME)

Course Code	25UAGT412
Course Name	STORAGE ENGINEERING
Max. Marks: 60	Duration: 2.5 Hours

Part A (Answer all questions. Each question carries 3 marks)				
Qn No.	Question	Marks	CO	BL
1.	Explain the functional requirements for storage of grains.	3	CO1	L2
2.	Differentiate between climacteric and non-climacteric fruits.	3	CO1	L2
3.	Classify storage structures based on their characteristics.	3	CO2	L2
4.	Explain the influence of ventilation on internal storage conditions.	3	CO2	L2
5.	Describe the principle of aeration in stored grain management.	3	CO3	L2
6.	Explain evaporative cooling storage of horticultural produce.	3	CO3	L2
7.	Apply grain pressure theories to the design of a grain storage bin.	3	CO4	L2
8.	Apply the standards and codes for the thermal design of a cold store.	3	CO4	L2
Part B (Answer any one full question from each Module. Each question carries 9 marks)				
Module I				
Qn No.	Question	Marks	CO	BL
9	Explain the physical and biochemical changes in stored commodities and the causes of spoilage.	9	CO1	L2
OR				
10	Explain the post-harvest physiology of perishables including respiration and ripening.	9	CO1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11	Explain the classification and characteristics of silos and their size and capacity considerations.	9	CO2	L2
OR				
12	Explain the moisture and temperature variations in stored	9	CO2	L2

	grains and the techniques for maintaining a suitable storage environment.			
Module III				
Qn No.	Question	Marks	CO	BL
13	Describe the design and operation of an aeration system for stored grain management.	9	CO3	L2
OR				
14	Describe the methods of controlled and modified atmosphere storage of horticultural produce.	9	CO3	L2
Module IV				
Qn No.	Question	Marks	CO	BL
15	Apply grain pressure theories and relevant standards to explain the functional and structural design of a grain storage structure.	9	CO4	L3
OR				
16	Apply design principles to explain the functional, structural and thermal design of a cold store.	9	CO4	L3
