

16AG302 DRYING AND STORAGE ENGINEERING

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
30	-	30	5	40	5	5	5	-



Course Description and Objectives:

This course covers the fundamentals of drying and storage of agricultural products. It starts with the basic concepts of drying and then application of these concepts for design of various dryers. It also covers the fundamentals of storage followed by design of different storage structures. The objective of this course is to enable the student to apply basic concepts of drying and storage in real life situations.

Course Outcomes:

The student will be able to :

- gain the knowledge about drying and storage of farm crops.
- understand various drying and storage techniques for agricultural products.

SKILLS:

- ✓ *Identify drying parameters and storage conditions for different crops.*
- ✓ *Design and develop crop specific dryers and storage structures.*
- ✓ *Select storage structures according to the requirements.*

ACTIVITIES:

- o *Design of economical dryers for local crops.*
- o *Design and development of storage structures for local crops.*
- o *Visits to commercial handling and storage facilities for grains.*

UNIT - 1**L-06**

INTRODUCTION TO DRYING: Moisture content and methods for determination, Importance of EMC and methods of its determination, EMC curve and EMC model, Principle of drying, Theory of diffusion, Mechanism of drying- Falling rate, Constant rate, Thin layer, Deep bed and their analysis; Critical moisture content, Drying models.

UNIT - 2**L-06**

APPLICATIONS OF DRYING: Calculation of drying air temperature and air flow rate, Air pressure within the grain bed, Shred's and Hukill's curve, Different methods of drying including puff drying, Foam mat drying, Freeze drying; Study of different types of dryers- Performance, Energy utilization pattern and efficiency; Study of drying and dehydration of agricultural products.

UNIT - 3**L-06**

INTRODUCTION TO STORAGE: Types and causes of spoilage in storage, Conditions for storage of perishable products, Functional requirements of storage, control of temperature and relative humidities inside storage, Calculation of refrigeration load.

UNIT - 4**L-06**

MECHANISM OF STORAGE STRUCTURE: Modified atmospheric storage and control of its environment, Air movement inside the storage, Storage of grains, Destructive agents, Respiration of grains, Moisture and temperature changes in stored grains; Conditioning of environment inside storage through natural ventilation, Mechanical ventilation, Artificial drying.

UNIT - 5**L-06**

STORAGE STRUCTURES: Grain storage structures such as Bukhari, Morai, Kothar, Silo, CAP, Warehouse - Design and control of environment; Storage of cereal grains and their products, Storage of seeds, Hermetically sealed and air-cooled storages- Refrigerated, Controlled atmosphere, Modified atmospheric and frozen storages; Storage condition for various fruits and vegetables under cold and CA storage system; Economic aspects of storage.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS****Total hours: 30**

1. Determination of moisture content of the product.
2. Study of mechanics of drying of grains.
3. Study of tray drying of fruits and vegetables.
4. Problems using psychrometric chart.
5. Design of dryers.
6. Design and layout of commercial bag storage facilities.
7. Design and layout of commercial bulk storage facilities.
8. Study of different domestic storage structures.

TEXT BOOKS:

1. A. S. Mujumdar, "Drying Technology in Agriculture and Food Science", Oxford and IBH Publishing House, 2000.
2. K. M. Sahay and K. K. Singh, "Unit Operations of Agricultural Processing", 2nd edition, Vikas Publishing House, New Delhi, 2004.

REFERENCE BOOKS:

1. J. L. Multon, "Preservation and Storage of Grains, Seeds and their By-products: Cereals, Oil Seeds, Pulses and Animal Feed". 1st edition, CBS Publishing and Distributions, Delhi, 1989.
2. S. Vijayaraghavan, "Grain Storage Engineering and Technology", 1st edition, Batra Book Service, New Delhi, 1993.
3. W. L. McCab and J. C. Smith, "Unit Operation in Chemical Engineering", 7th edition, McGraw Hill, Tokyo, 2005.