



## IX. List of Practicals

S.No.	Topic	No. of Practicals
1.	Detailed design and drawing of mechanical dryers	2
2.	Detailed design and drawing of milling equipment	2
3.	Design of separators	2
4.	Design of evaporators	2
5.	Design of mixers and separators	2
6.	Project report preparation by students. (Individual student will select a processing plant, develop design report include product identification, site selection, estimation of plant size, process and equipment, process flow-sheeting, plant layout, its evaluation and profitability analysis)	5
	<b>Total</b>	<b>15</b>

## X. Suggested Reading

- Antonio LG and Gustavo VBC. 2005. *Food Plant Design*. CRC Press.
- Couper. 2012. *Chemical Process Equipment*. Selection and Design Elsevier.
- George S and Athanasios EK. 2015. *Handbook of Food Processing Equipment*. Springer.
- Lloyd EB and Edwin HY. 1959. *Process Equipment Design*. Wiley-Interscience.
- Michael MC. 2013. *Food Plant Sanitation: Design, Maintenance, and Good Manufacturing Practices*. CRC Press.

**I. Course Title : Seed Process Engineering**

**II. Course Code : PFE 512**

**III. Credit Hours : 1+1**

### IV. Aim of the course

To acquaint and equip the students with seed processing along with the design features of the equipment used in their processing.

### V. Theory

#### Unit I

Processing of different seeds and their engineering properties, principles and importance of seed processing.

#### Unit II

Performance characteristics of different unit operations such as precleaning, grading, conveying, elevating, drying, treating, blending, packaging and storage, seed processing machines like scalper, debreader, huller, velvet separator, spiral separator, cleaner-cum-grader, specific gravity separator, indent cylinder, disc separator, and colour sorter, seed treater, weighing and bagging machines, their operation and maintenance, installation and determination of their capacity, seed quality maintenance during processing, plant design and layout, economy and safety consideration in plant design.

#### Unit III

Seed drying principles and methods, theory of seed drying, introduction to different types of heated air dryers, significance of moisture equilibrium, method of maintaining safe seed moisture, thumb rule and its relevance.

### Unit IV

Importance of scientific seed storage, types of storage structures to reduce temperature and humidity, management and operation/cleanliness of seed stores, packaging-principles, practices, materials and hermetic packaging, seed treatment methods and machines used, method of stacking and their impact, design features of medium and long term seed storage building.

### VI. Practical

Study of various seed processing equipments such as pre-cleaners, scalpels, air screen cleaners, graders, spiral and pneumatic separators, seed treating equipment, bag closures, scale etc. and their performance evaluation, design and layout of seed processing plant and its economics, analysis of cost of operation and unit cost of processed product, effect of drying temperature and duration of seed germination and storability.

### VII. Learning outcome

Student's capability to understand processing and storage requirement of seed maintaining its vigor and viability, suitable equipment for seed processing as per requirement of seed industries.

### VIII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Processing of different seeds and their engineering properties.	1
2.	Principles and importance of seed processing.	1
3.	Performance characteristics of different unit operations such as pre-cleaning, grading, conveying, elevating, drying.	1
4.	Treating, blending, packaging and storage, seed processing machines like scalper, de-breeder, huller.	1
5.	Velvet separator, spiral separator, cleaner-cum-grader, specific gravity separator, indent cylinder, disc separator, and colour sorter.	1
6.	Seed treater, weighing and bagging machines, their operation and maintenance, installation and determination of their capacity.	1
7.	Seed quality maintenance during processing.	1
8.	Plant design and layout, economy and safety consideration in plant design.	2
9.	Seed drying principles and methods, theory of seed drying.	1
10.	Introduction to different types of heated air dryers.	1
11.	Significance of moisture equilibrium, method of maintaining safe seed moisture, thumb rule and its relevance.	1
12.	Importance of scientific seed storage, types of storage structures to reduce temperature and humidity.	1
13.	Management and operation/cleanliness of seed stores, packaging-principles, practices, materials and hermetic packaging.	1
14.	Seed treatment methods and machines used, method of stacking and their impact.	1
15.	Design features of medium and long term seed storage building.	1
	<b>Total</b>	<b>16</b>



## IX. List of Practical

S.No.	Topic	No. of Practicals
1.	To study seed processing equipment such as pre-cleaners, scalpers and their performance evaluation.	2
2.	To study graders and their performance evaluation.	2
3.	To study air screen cleaners and their performance evaluation.	1
4.	To study spiral and pneumatic separators and their performance evaluation.	2
5.	To study seed treating equipment, bag closures, scale and their performance evaluation.	2
6.	To study design and layout of seed processing plant and its economics.	2
7.	To analyze the cost of operation and unit cost of processed product.	2
8.	To study the effect of drying temperature and duration of seed germination and storability.	2
<b>Total</b>		<b>15</b>

## X. Suggested Reading

- Babasaheb. 2004. *Seeds Handbook: Processing and Storage*. CRC.
- Gregg *et al.* 1970. *Seed Processing*. NSC.
- Guar. 2012. *A Handbook of Seed Processing and Marketing* Agrobios.
- Henderson S and Perry S M. 1976. *Agricultural Process Engineering*. 5<sup>th</sup> Ed. AVI Publisher.
- Mathad. 2017. *Seed Processing: A Practical Approach*. NIPA.
- Sahay KM and Singh KK. 1994. *Unit Operation of Agricultural Processing*. Vikas Publisher House.
- Vaughn. 1968. *Seed Processing and Handling*. [https://www.mcia.msstate.edu/pdf/seed-processing-and-handling\\_1.pdf](https://www.mcia.msstate.edu/pdf/seed-processing-and-handling_1.pdf).

**I. Course Title : Agri-Project Planning and Management**

**II. Course Code : PFE 513**

**III. Credit Hours : 2+1**

### IV. Aim of the course

To acquaint and equip the students with the techniques of project development and evaluation along with different standards.

### V. Theory

#### Unit I

Project development, market survey and time motion analysis.

#### Unit II

Selection of equipment, technology option, techno-economic feasibility and processing in production catchment.

#### Unit III

Product and process design, PERT, CPM, transport model, simplex, linear and dynamic programming, operation log book. Material balance and efficiency analysis, performance testing, performance indices, energy requirement and consumption. Marketing of agricultural products, market positioning.

#### Unit IV

BIS/FSSAI/ISO standards/ guidelines on best practices, equipment and their design and operation for handling, processing and storage of food/feed.