



# GUJARAT TECHNOLOGICAL UNIVERSITY

## BACHELOR OF ENGINEERING SYLLABUS

Subject Code : 3155104

Subject Name : Post Harvest Engineering of Cereals, Pulses and Oil Seeds

WEF Academic Year :	2023-24
Semester :	5
Category of the Course :	Professional Elective Course

### Prerequisite:Nil

**Rationale:** Introduction to post harvest operation to process cereals, pulse, oilseeds moisture content, cleaning and separation. Principle, methods of parboiling, physical- chemical change during parboiling. Nutritional and cooking qualities. Grain milling operations. Rice milling, milling of wheat, corn, pulses and spices. Handling equipment for a grain market. Indigenous and modern oil extraction process and machinery. Developments in oil extraction. Utilization of by products of cereals, pulses, oil seeds and spices. Packaging of cereals, pulses and oil and their products.

### Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR		Theory		Practical		
			ESE (E)	PA(M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

### Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1.	Cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders.	8	20
2.	Size reduction: principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. Material handling equipment. Types of conveyors: Belt, roller, chain and screw. Elevators: bucket, Cranes & hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying.	9	20
3.	Mixing: Theory of mixing of solids and pastes, Mixing index, types of mixers for solids, liquid foods and pastes. Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods,	7	20



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	CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment.		
4.	Milling of wheat, unit operations and equipment. Milling of pulses: traditional milling methods, commercial methods, pre - conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines, Milling of corn and its products. Dry and wet milling.	8	20
5.	Milling of oilseeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran. Extrusion cooking: principle, factors affecting, single and twin screw extruders. By-products utilization.	8	20

### Reference Book:

1. Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.67
2. Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.
3. Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing house Pvt. Ltd. New Delhi.
4. Geankoplis C. J. Transport processes and unit operations, Prentice Hall of India Pvt Ltd, New Delhi
5. Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.
6. Henderson, S.M., and Perry, R. L. Agricultural Process Engineering, Chapman and hall, London
7. McCabe, W.L., Smith J.C. and Harriott, P. Unit operations of Chemical Engineering. McGraw Hill.
8. Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition. Academic Press, London.
9. Brooker, D.B., Bakker-Arkema,F.W., Hall, C.W. 1992. Drying and storage of grains and oilseeds, AVI publication

### Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level*
01	Performance evaluation of different types of cleaners and separators.	RM
02	Determination of separation efficiency.	UN
03	Study of different size reduction machines and performance evaluation.	UN
04	Study of different equipments in rice mills and their performance evaluation.	AN
05	Study of various types of dryers.	AP

\*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create



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### Suggested Course Practical List:

- 1 Study of different types of cleaners and separators and performance evaluation
- 2 Determination of separation/cleaning efficiency
- 3 Study of different size reduction machines and performance evaluation
- 4 Determination of fineness modulus and uniformity index
- 5 Study of different types of conveying and elevating equipments
- 6 Study of different types of mixers
- 7 Measurement of moisture content: dry basis and wet basis
- 8 Study on drying characteristics of grains and determination of drying constant
- 9 Determination of EMC (Static/dynamic method)
- 10 Study of various types of dryers
- 11 Study of different equipments in rice mills and performance evaluation
- 12 Study of different equipments in pulse mills and performance evaluation
- 13 Study of different equipments in oil mills and performance evaluation
- 14 Process flow charts related to processing of cereals and pulses
- 15 Process flow charts related to processing of oil seeds

### List of Laboratory/Learning Resources Required:

#### Major Equipments

- Tray Dryers
- Fluidized Bed Dryers
- Spray Dryers
- Drum Dryers
- Hammer Mills
- Roller Mills
- Cutting Mills
- Ball Mills
- Crushers



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### List of open source software/learning websites

1. <https://nptel.ac.in/courses/126/103/126103017/>
2. [https://www.youtube.com/watch?v=ZwBoZVrZxbk&list=PL2E9\\_TIQsGRQy05HBihSowy1WP9HBtdy](https://www.youtube.com/watch?v=ZwBoZVrZxbk&list=PL2E9_TIQsGRQy05HBihSowy1WP9HBtdy)
3. <https://www.digimat.in/nptel/courses/video/126105011/L12.html>
4. <https://nptel.ac.in/courses/126105015/>

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