

Post Harvest Engineering of Cereals, Pulses and Oil Seeds 3(2+1)

Theory:-

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. 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. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination, Psychrometric chart and its use in drying, Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations, Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sunmechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray. 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, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. 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. 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.

Practical :-

Performance evaluation of different types of cleaners and separators, Determination of separation efficiency, Study of different size reduction machines and performance evaluation, Determination of fineness modulus and uniformity index, Study of different types of conveying and elevating equipments, Study of different types of mixers. Measurement of moisture content: dry basis and wet basis, Study on drying characteristics of grains and determination of drying constant, Determination of EMC (Static and dynamic method), Study of various types of dryers, Study of different equipments in rice mills and their performance evaluation, Study of different equipments in pulse mills and their performance evaluation, Study of different equipments in oil mills and their performance evaluation, Type of process flow charts with examples relating to processing of cereals pulses and oil seeds, Visit to grain processing industries.

Suggested Readings :-

Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.

Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.

Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing house Pvt. Ltd. New Delhi.

Geankolis C. J. Transport processes and unit operations, Prentice Hall of India Pvt Ltd, New Delhi

Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.

Henderson, S.M., and Perry, R. L. Agricultural Process Engineering, Chapman and hall, London

McCabe, W.L., Smith J.C. and Harriott, P. Unit operations of Chemical Engineering. McGraw Hill.

Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition. Academic Press, London.