

**FT303 CEREAL PROCESSING****Course Description & Objectives:**

*This course will impart knowledge to the students on cereal and millet processing.*

*By the end of the course, the students will be able to understand traditional and improved methods of cereal processing and to develop good expertise on the technical aspects of preparation of cereal and millet based products.*

**Course Outcomes:**

*By the end of the course, the students will be able to*

- 1. Know about different cereals and millets and their processing aspects*
- 2. Acquaint with knowledge on utilization of by-products from cereals, preparation of ready to eat breakfast cereals and instant cereal foods*

**UNIT I - Cereal and Millets**

Present status and future prospects of cereals and millets - Current trends in area, production and yield. Structure of cereals - Wheat, Corn, Rice, Barley, Oat, Rye and Sorghum. Composition and nutritive value of cereals. Physico-chemical properties of cereals, major and minor millets - Bulk density, true density, Porosity, Sphericity, Roundness, 1000 grain weight, Coefficient of friction and Angle of repose. Thermal properties - Specific heat - Thermal Conductivity - Thermal diffusivity. Theory of grain drying - Thin layer drying - Moisture content - Moisture measurement - Direct and indirect methods

**UNIT II - Rice Processing**

Equilibrium moisture content (EMC) - Determination of EMC - EMC models - Hysteresis - Bound, unbound and free moisture. Drying curves - Constant rate period and falling rate period - Deep bed drying - Problems on moisture content. Methods of grain drying - Conduction, Convection, Radiation, Dielectric, Chemical and Sack drying. Grain dryers - Unheated and heated air dryers - Batch and continuous type - Flat bed type - PHTC type - Columnar type - LSU type - Baffle type - Rotary type. Paddy and its handling - Cleaning - Drying - Cracking of paddy during drying and its prevention - Methods of paddy drying - Sun drying and mechanical drying. Rice milling - Traditional rice milling machinery - Engelberg huller, Huller mill, Battery of hullers, Sheller cum huller mill, Sheller mill, Sheller cum cone polisher mill. Modern rice milling process - Cleaning, Dehusking, Husk separation, Paddy separation, Polishing and Grading operations and their related equipment. Advantages and disadvantages of milling machineries - Factors that affect rice output during milling. By-products of rice milling - Rice bran, rice hulls, broken grains, rice pollards. Parboiling of paddy and its principle - Physico-chemical changes during parboiling - Steps in parboiling - soaking, steaming and drying

**UNIT III - Methods of Rice Processing**

Effect of parboiling on milling, nutritional and cooking quality of rice. Advantages and disadvantages of parboiling. Methods of parboiling of paddy - Traditional methods - Atapa, Balam, Josh, Sela and Siddha processes. Parboiling - single boiling and double boiling methods - Improved methods - CFTRI method - Schule process - Crystal rice process. Rice conversion process - Jadavpur University method - Malek process - Rice Growers Association of California process - Avorio process. Fernandes process - IRRRI

process - True continuous parboiling process –RPECmethod. Sodium chromate method - Brine solution method - Kisan continuous parboiling method –Pressureparboiling method.

#### **UNIT IV- Rice Value Added Products**

Ageing of rice - Enrichment of rice. Rice fortification - Methods of rice fortification. Processed products from rice -Rice flour - Parched rice - Puffed rice - Flaked rice – Ricestarch - Instant rice - Canned rice. Wheat - Types of wheat - Wheat quality and grading. Wheat flour milling -Components of a wheat mill.

#### **UNIT V- Milling Of Corn**

Corn dry milling and wet milling - Products of corn milling. Milling of Barley, Oats and Rye. Milling of Sorghum, Bajra, Ragi - Their food uses. Malting of cereals - Uses of malt. Breakfast cereal foods – Flaked breakfast cereals, puffed breakfast cereals, shredded and granular breakfast cereals and cereals puffed by extrusion

#### **TEXT BOOKS:**

1. Chakraverty A. *Post-Harvest Technology of Cereals, Pulses and Oil seeds*. Oxford and IBHPublishing Co. Ltd., Calcutta.
2. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. *Hand Book of Post-Harvest Technology*. Marcel Dekker Inc., New York. Basel.

#### **REFERENCE BOOKS:**

1. Araullo E.V, Padua D.B.D and Graham. *Rice- Post Harvest Technology*. IDRC, Canada.
2. Kent N.L and Evers D. *Technology of Cereals*. Woodhead Publishing Co. Ltd., Cambridge,England. Scott. *Flour milling process*.
3. ShakuntalaManay N and ShadaksharaswamyM. *Foods - Facts and Principles*. New AgeInternational (P) Ltd Publishers, New Delhi.
4. Srilakshmi B. *Food Science*. 2nd Edn.. New Age International (P) Ltd Publishers, New Delhi.
5. Subbulakshmi G and Shobha A. Udipi. *Food Processing and Preservation*. New Age International(P) Ltd Publishers, New Delhi.