Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-3

Subject: Post Harvest Engineering - BETFT13302

Type of course: Major

Prerequisite: Nil

Rationale: The course aims to equip students with a comprehensive understanding of post-harvest engineering and the properties of food materials that are essential for food processing and preservation. The curriculum is structured to ensure both theoretical and practical knowledge, which is critical in addressing food quality, safety, and sustainability concerns within the agriculture and food industries. The course content has been carefully organized into four major units, each building on the others to provide students with the tools and skills necessary for the food processing sector.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Post-Harvest Technology and Food Material Properties** • Overview of Post-Harvest Technology: Concept and science, Introduction to different agricultural crops, their cropping pattern, production, harvesting and post-harvest losses, reasons for losses, importance of loss reduction, Post-Harvest Handling operations • Water Activity: Water binding and its effect on enzymatic and non-enzymatic reactions and food texture, control of water activity and moisture • Engineering Properties of Food Materials: Physical, thermal, aerodynamic, optical, mechanical, rheological, and electromagnetic properties and their measurement	15	25%

2	**Cleaning, Sorting, and Grading of Agricultural Produce** • Cleaning: Cleaning of grains, washing of fruits and vegetables, types of cleaners, screens, types of screens, rotary screens, vibrating screens, machinery for cleaning of fruits and vegetables (air cleaners, washers), cleaning efficiency, care and maintenance; Peeling • Sorting and Grading: Sorting, grading, methods of grading; Grading - Size grading, color grading, specific gravity grading; Screening, equipment for grading of fruits and vegetables, grading efficiency, care and maintenance	10	20%
3	**Separation, Decorticating, Shelling, and Milling Operations** • Separation: Magnetic separator, destoners, electrostatic separators, pneumatic separator • Decorticating and Shelling: Principles of working, design and constructional details, operating parameters, maintenance, etc. of various decorticators/dehullers/shellers, description of groundnut decorticators, maize shellers, etc. • Milling: Milling, polishing, grinding, milling equipment, dehuskers, polishers (abrasion, friction, water jet), flour milling machines, pulse milling machines, grinders, cutting machines, oil expellers, machine efficiency and power requirement	15	25%
4	**Materials Handling and Conveying Systems** • Materials Handling: introduction to different conveying equipment used for handling on grain, fruits and vegetables • Handling Systems: Classification, principle of operations, conveyer system • Belt conveyer: principle, characteristics, design, relation between belt speed and width, capacity, inclined belt conveyer, idler spacing, belt tension, driven tension, belt tripper • Chain Conveyer: principle of operations, Advantages disadvantages, capacity and speed, conveying chain • Screw conveyer: principle of operations, capacity, power, loading and unloading, inclined and vertical screw conveyer • Bucket elevator: principle of operations, principle of operations, Advantages disadvantages, capacity and speed, bucket pick up and discharge, bucket types • Pneumatic conveying system	20	30%

Continuous Assessment:

Sr. No.	Active Learn	Marks
1.	**Post-Harvest Handling Challenges Survey:** Groups of 3 or 4 students will conduct an online survey or interview local farmers, small-scale food processors, or market vendors to assess their post-harvest handling practices. After gathering the responses, students will analyze the data, identify common challenges, and propose solutions for handling produce after harvest. The final report and analysis will be submit on the GMIU portal.	10

2.	**Sorting and Grading Systems in Home Kitchens:** Each student will observe and document how they sort and grade food materials (e.g., fruits and vegetables) in their kitchen based on size, color, and quality. The student will create a report explaining the sorting process and its impact on food quality, linking it to the grading systems discussed in class. The findings should be submitted as a PPT or PDF on the GMIU portal.	10
3.	**Virtual Decorticating and Milling Equipment Review:** Each student will research different types of milling and decorticating machines used in the industry (e.g., for rice, wheat, and pulses) by reviewing online resources, machine manuals, or instructional videos. The student will write a review comparing the designs, operating principles, and maintenance requirements of these machines and submit the report on the GMIU portal.	10
Total		30

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

List of Practical

Sr. No	Title	Hours
1	Determining the Moisture Content of Agricultural Products.	2
2	Determination of shape and size of food materials.	2
3	Determination of density and porosity of powder food materials.	2
4	Determination of specifics gravity of solid food materials.	2
5	Determination of thermal velocity of grain sample.	2
6	Study of thermal and rheological properties of food materials.	2
7	Study of cleaners and washers for agricultural produces.	2
8	Study of maize shellers.	2

9	Determining the Power Consumption of a Seed Grinder	2
10	Study of different components of flour mills	2
11	Mini project	10
	Total	30

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the principles of post-harvest technology and methods to reduce post-harvest losses in agricultural products.
CO2	Apply knowledge of food material properties to improve food processing techniques and quality control.
CO3	Demonstrate the ability to use various cleaning, sorting, and grading methods to maintain food quality.
CO4	Operate and optimize different machinery for separation, decorticating, shelling, and milling operations in food processing.

Instructional Method:

The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by blackboard, may also use any of the tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content, 10% of topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done based on the Active Learning Assignment

Reference Books:

[1] Post-harvest technology for cereals, pulses and oil seed by A. Chakraverty.
[2] Post-harvest technology and food processing engineering by Amaledy Chakraverty.
[3] Processing equipment for agricultural produce by Carl W Hall and Denny C Davis.
[4] Food Processing handbook by G. Boumaus.
[5] Unit operations in food processing by RL Earle.
[6] Agricultural process engineering by SM Henderson.