



UNIVERSITY OF NAIROBI
SCHOOL OF ENGINEERING
DEPARTMENT OF ENVIRONMENTAL & BIOSYSTEMS ENGINEERING

COURSE UNIT: FEB 461 PROCESS AND FOOD ENGINEERING

Semester I

Fourth Year

2012/13 Academic Year

Lecturer: Eng. Joackim M. Mutua, RCEng, FEIK

COURSE OBJECTIVES

The student will become acquainted with the principles of handling and processing food and agricultural products. Particular emphasis will be given to the principles of operation of equipment used in the processing industry and the response of biological materials to these operations.

The course will also aim to develop an understanding of equipment and unit processes in agro-industries.

Also covered will be the advances of engineering and technology in post-harvest and agri-food processing with particular focus on properties of products, unit operations, equipment and process control

COURSE OUTLINE:

WEEK	TOPIC DESCRIPTION
1	1.0 Introduction <ul style="list-style-type: none">- Importance of physical properties of biological materials- Course objectives and- Importance 1.1 Physical Properties of food: What they are and their relation to other food properties.
2 - 3	2.0 Geometrical Properties <ul style="list-style-type: none">- Shape and size- Volume and Density- Surface area- Porosity

WEEK	TOPIC DESCRIPTION
	<p>2.1 Optical Properties</p> <ul style="list-style-type: none"> - Color - Gloss <p>2.2 Thermal Properties</p> <ul style="list-style-type: none"> - Specific Heat - Thermal conductivity - Thermal Diffusivity - Surface Heat Transfer Coefficient <p>2.3 Electrical Properties</p> <ul style="list-style-type: none"> - Electrical conductivity - Dielectric properties
4	<p>3.0 Rheological Properties</p> <ul style="list-style-type: none"> - Introduction to Rheology - Materials in solid and semi solid state - Stress/Strain in Biological materials - Constant stress - Rheological Models
5 - 6	<p>4.1 Materials in Liquid state</p> <ul style="list-style-type: none"> - Newtonian and Non-Newtonian fluids - Flow characteristics of organic fluids <p>4.2 Aero-dynamic properties of biological materials</p> <ul style="list-style-type: none"> - Drag coefficient and terminal velocity - Separation of foreign materials - Pneumatic transport and handling - Hydraulic transport and handling
7	<p>5.0 Theory and principles of crop and fruit drying</p> <ul style="list-style-type: none"> - Basic principles of grain drying - Drying processes and Psychrometry - Drying systems (Natural and Forced air drying)
8	<p>6.0 Crop Processing Engineering</p> <ul style="list-style-type: none"> - Handling - Cleaning - Sorting - Grading
9	<p>7.0 Milling and Size modification</p> <ul style="list-style-type: none"> - Pre cooling - Packaging

WEEK	TOPIC DESCRIPTION
10	8.0 Specialized Equipment for sorting and processing - Tea - Coffee - Sugar - Rice - Vegetables and Fruits - Oil and Fiber Extraction
11	CAT
12	Practical / Term Paper
13	Revision
14 -15	EXAMS

GRADING OF THE COURSE

Assignments & Term Paper	5%
Lab Work	5%
CAT	20%
Semester Exams	70%

REFERENCE BOOKS

Richard Stroshine (2000); Physical Properties of Agricultural Materials and Food products.

Mohsenin, N.N (1980). Physical Properties of Plant and Animal Materials. Gordon and Breach Science Publ. London.

Mohsenin M. (1989). Biological and Thermal properties of Agricultural Materials.

Geankoplis, C. J. (1993). Transport Processes and Unit Operations. PTR Prentice-Hall, Inc.

Brooker and Bakker (1990). Drying of Agricultural Products

Henderson and Perry (1986). Agricultural Process Engineering

Sahay K M and Singh K.K; Unit Operations of Agricultural Processing; Vikas Publishing House Pvt Limited, 2009