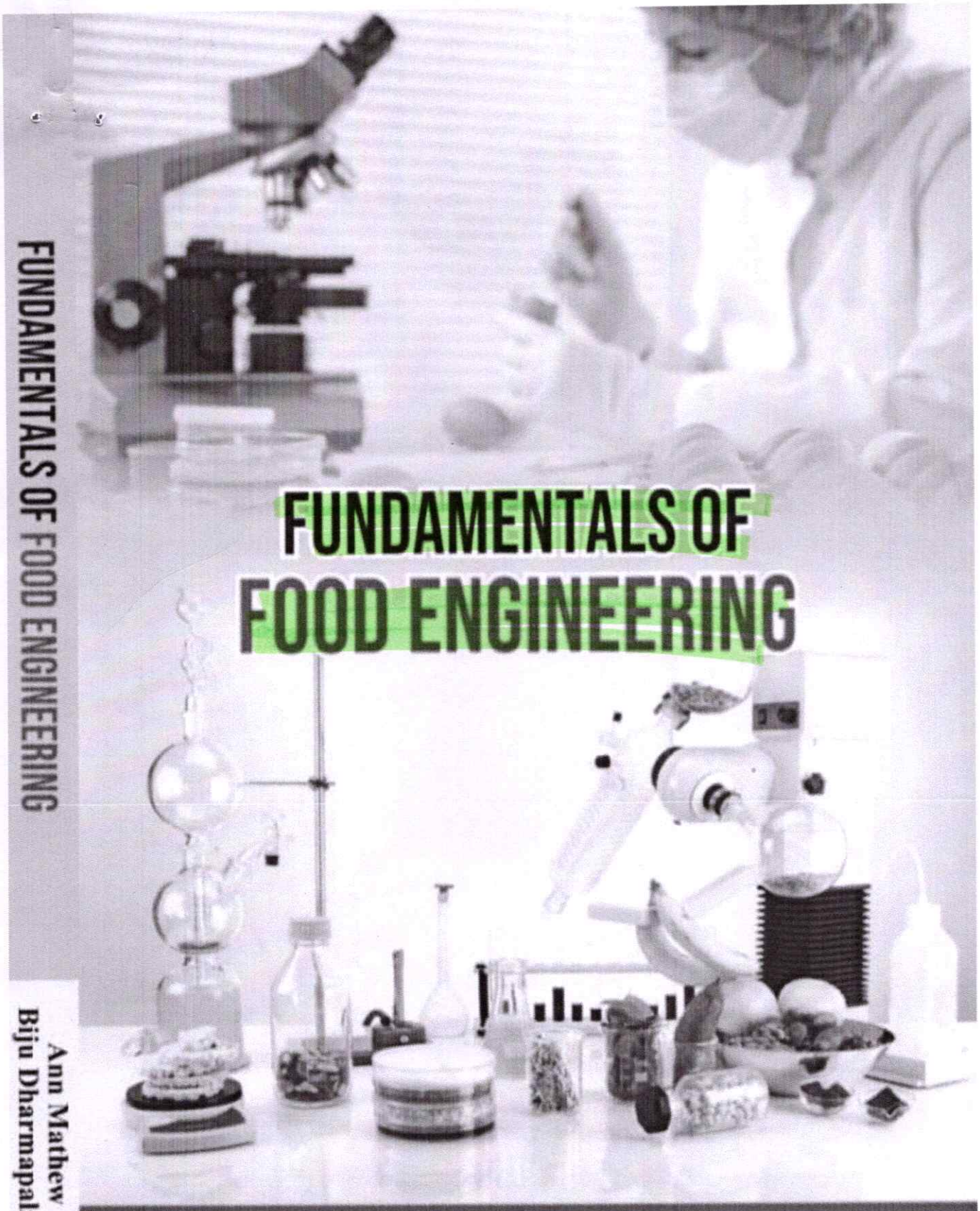

# FUNDAMENTALS OF FOOD ENGINEERING

Ann Mathew and Biju Dharmapalan

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MAR ATHANASIOS COLLEGE FOR ADVANCED STUDIES TIRUVALLA
MACFAST

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Tiruvalla- 689101, Kerala

# Fundamentals of
# FOOD ENGINEERING

*Ann Mathew*
*Biju Dharmapalan*

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# 1

# Units and Dimensions

## 1.1 Introduction

A dimension represents a physical entity qualitatively. It describes 'what' it is. Whereas units represent a physical entity quantitatively, by precisely describing 'how much' it is. Force, mass, length, temperature and time, are all considered dimensions. Magnitude of a dimension is expressed quantitatively by a unit. For example, Newton, kilogram, meter, Kelvin and second are all considered units. Physical quantities are measured using different unit systems. There are seven **base units** and two **supplementary units**. All other quantities are represented using **derived units**. Normally, the dimensional representations of length, mass and time are [L], [M] and [T] respectively. List of all the quantities with their SI units are given in Table1, Table 2 and Table 3.

## 1.2 Base Units

As per System International (SI), there are seven base units. All other units are derived on the basis of these seven units.

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where,

$\Delta P$ => pressure difference across the membrane

K => membrane permeability constant (kg/[$m^2$kPa s])

A => membrane surface area ( $m^2$)

### 7.5.3 Reverse Osmosis

When two solutions of different concentrations are in contact with each other, water moves from the solution of high concentration of water to the solution of low concentration of water, trying to equalize the water concentration on both sides of the membrane. This movement of water across the membrane is called as 'osmosis'.

Consider two solutions A and B. Solution A has higher solute concentration (that is, low water concentration) and solution B has lower solute concentration (or higher water concentration). In order to reach equilibrium, water moves from B to A. This results in an increase in the volume and hence the osmotic pressure of A. Now, if we apply an external pressure to solution A, greater than the osmotic pressure, water flows from A to B. This reversal in the direction of movement of water by the application of an external pressure overcoming the osmotic pressure is termed as 'reverse osmosis'. It is widely used in sea water purification. Unlike electro dialysis membrane, a reverse osmosis system permits water to permeate through the membrane whereas salts and sugars are rejected. A cellulose acetate membrane is widely used as a membrane in reverse osmosis system.

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## About the Book

The book **'Fundamentals of Food Engineering'** provides the most basic concepts of Food Engineering for students who are a novice to the field of food science and technology. It focuses on the elementary principles and ideas essential for understanding the subject in deep. It covers the core concepts and theory on which the food industry functions, in a simple and easy-to-grasp pattern. The book will be useful for B.Sc., B.Tech, M.Sc. and M.Tech courses in food science and technology. It will be useful for competitive examinations like UGC –NET and ICAR-NET.

## About the Authors

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