The content listed below is taken from ‘Doran’ as an example. Similar content may also be found in other text books. You are expected to have an understanding of this or similar content when you arrive in Delft; you are not expected to have learned it by heart.

Book: Bioprocess Engineering Principles by P.M. Doran

Chapter 2 Introduction to Engineering Calculations
- Physical Variables, Dimensions and Units
- Force and Weight
- Measurement Conventions
- Standard Conditions and Ideal Gases
- Physical and Chemical Property Data
- Stoichiometry

Chapter 3 Presentation and Analysis of Data
- Errors in Data and Calculations
- Presentation of Experimental Data
- Data Analysis
- Graph Paper with Logarithmic Coordinates
- General Procedures for Plotting Data
- Process Flow Diagrams

Chapter 4 Material Balances
- Thermodynamic Preliminaries
- Law of Conservation of Mass
- Procedure for Material-Balance Calculations
- Material Balance with Recycle, By-Pass and Purge Streams
- Stoichiometry of Growth and Product Formation

Chapter 5 Energy Balances
- Basic Energy Concepts
- General Energy-Balance Equations
- Enthalpy Calculation Procedures
- Enthalpy Change in Non-Reactive Processes
- Steam Tables
- Procedure for Energy-Balance Calculations without Reaction
- Enthalpy change due to reaction
- Heat of reaction for processes with biomass production
- Energy balance equation for cell culture

Chapter 6 Unsteady-State Material and Energy Balances
- Unsteady-State Material-Balance Equations
- Unsteady-State Energy-Balance Equations
- Solving Differential Equations
- Solving Unsteady-State Mass Balances
- Solving Unsteady-State Energy Balances
Chapter 7  Fluid Flow
- Classification of Fluids
- Fluids in Motion
- Viscosity
- Momentum Transfer
- Non-Newtonian Fluids
- Viscosity Measurements
- Rheological properties of fermentation broths

Chapter 8  Mixing
- Functions of mixing
- Mixing equipment
- Flow patterns in stirred tanks
- Impellers and stirrer power requirements
- Power input
- Mechanisms of mixing
- Improving mixing in fermenters
- Effect of rheological properties on mixing

Chapter 9  Heat Transfer
- Heat transfer equipment
- Mechanisms of heat transfer
- Conduction
- Heat transfer between fluids
- Design equations for heat transfer systems

Chapter 10 Mass Transfer
- Molecular diffusion
- Role of diffusion in bioprocessing
- Film theory
- Convective mass transfer
- Oxygen uptake in cell cultures
- Factors affecting oxygen transfer in fermenters
- Measuring dissolved oxygen concentration
- Estimating oxygen solubility
- Mass transfer correlations for oxygen transfer
- Measurement of $k_{l,a}$
- Measurement of the specific oxygen uptake rate

Chapter 11 Unit Operations
- Overview of downstream processing
- Overview of cell removal operations
- Filtration
- Centrifugation
- Cell disruption
- The ideal stage concept
- Aqueous two-phase liquid extraction
- Precipitation
- Adsorption
- Membrane filtration
- Chromatography
- Crystallization
- Drying