



# MATERIAL & ENERGY BALANCE COMPUTATIONS

**PROF. ARNAB ATTA**  
**PROF. RABIBRATA MUKHERJEE**

Department of Chemical Engineering  
IIT KGP

**TYPE OF COURSE** : New | Core | UG

**COURSE DURATION** : 12 Weeks (26-Jul' 21 - 15-Oct' 21)

**EXAM DATE** : 24 Oct 2021

**INTENDED AUDIENCE** : Undergraduate Second Year students in Chemical Engineering, Biochemical Engineering and Biotechnology.

**INDUSTRIES APPLICABLE TO** : Chemical and Petrochemical Process Industries such as BASF, Tata Chemicals, Reliance Industries, IFFCO, Dr. Reddy's, Haldia Petrochem, etc.

## **COURSE OUTLINE :**

This is an introductory material and energy balance course that plays significant role in the chemical engineering as well in the biological, petroleum, and environmental engineering curriculum. It enables students to be conversant with the engineering approaches for solution of the process-related problems, with and without chemical reactions. The content of this course can be broadly classified into two topics: (1) material balances, and (2) energy balances. The objective of this course is to learn the formulation and interpretation of material and energy balances on various chemical process schemes

## **ABOUT INSTRUCTOR :**

Dr. Arnab Atta is presently an Associate Professor of Chemical Engineering at IIT Kharagpur. After receiving his bachelor and master of Chemical Engineering degrees from the Department of Chemical Engineering at Jadavpur University, Kolkata, he accomplished his Ph.D. in Chemical Engineering from IIT Delhi, New Delhi as a National Doctoral Fellow.

Rabibrata Mukherjee is presently a Professor at the Department of Chemical Engineering at IIT Kharagpur. He obtained his PhD from IIT Kanpur in the year 2007. He is an internationally recognized expert in soft nano patterning and thin film instability, with specific emphasis on ordering and arranging objects by confined self organization at the nano and meso scale. So far he has published 85 international journals papers and holds 7 Indian patents.

## **COURSE PLAN :**

**Week 1:** Introduction to Engineering Calculations, Processes and Process Variables

**Week 2:** Material Balance Calculations: Fundamentals & Single Unit

**Week 3:** Material Balance Calculations: Multiple Units

**Week 4:** Recycle & Bypass, Introduction to Chemical Reaction Stoichiometry

**Week 5:** Chemical Reaction Stoichiometry & Reactive Processes

**Week 6:** Combustion reactions, Introduction to Single- & Multi-phase Systems

**Week 7:** Introduction to Energy Balance & Basic Concepts

**Week 8:** Energy Balance without Chemical Reaction

**Week 9:** Energy Balance without Chemical Reaction

**Week 10:** Energy Balance with Chemical Reaction

**Week 11:** Energy Balance with Chemical Reaction

**Week 12:** Humidity and Psychrometric Chart