Materials and Energy Balance in Metallurgical Processes
(No. of credits: 4)

Unit – 1:
Basics of energy balance: Introduction; Measurement of quantities; Exercises on measurement of quantities; Stoichiometry, concept; Exercises on stoichiometry; Thermochemistry: Basics; Exercises on thermochemistry calculations; Errors in measurements; Fundamentals of energy balance;

Unit - II
Introduction to Mineral beneficiation; Materials balance in mineral processing; Exercises in mineral processing; Calcination; Sources of energy for pyrometallurgical extraction; Calculations on air requirements in metal extraction; Roasting: Basics and predominance area diagram; Material balance in roasting of sulphides ores-I; Material balance in roasting- of sulphide ore-II; Material balance in roasting- of sulphide ore-III; Heat balance in roasting

Unit – III
Smelting: Basics; Material balance in matte smelting-I; Material balance in matte smelting-II; Reduction smelting-basics; Material balance in lead smelting; Material balance in Imperial smelting;

Unit – IV
Basics of ironmaking; Materials balance in cokemaking; Ironmaking in blast furnace; Blast furnace material balance-I

Unit – V
Blast furnace material balance-II; RIST Diagram; Exercises on RIST diagram; Converting-basics; Materials balance in converting; Energy balance in cupola melting

Unit - VI
Gasification; Materials and heat balance in a gasifier; Industrial furnaces; Energy audit in industrial furnaces; Energy balance and conservation of energy resources

Reference books:
1. R.Schuhman n Jr. Metallurgical engineering, vol.1: Engineering principles.
2. O.P.Gupta: Elements of fuels,furaces and refractory.

Video content link:
http://nptel.ac.in/courses/113104010/