Materials 3F03 - High Temperature Materials Production
Course Information - Winter 2017

Instructor:	Room (Lecture):	Room (Tutorial):	Room (Office):	Email:
Brian J. Jamieson	T13 125	JHE 326H	JHE 356	jamiebj@mcmaster.ca

Teaching Assistant:	Room (Office):	Room (Office Hours):	Email:
Keyan Miao	JHE A206/A	JHE A206	miaok@mcmaster.ca

Calendar Description

Fundamentals of materials processing, building on knowledge of heat and mass transfer. High temperature processing of materials, focusing on heat sources, solid state processing of powders, and liquid state processing. Three lectures and one tutorial, one term.

Prerequisite: MATLS 3A03 or CHEM ENG 2A04, and MATLS 3B03, 3E04

This course parallels MATLS 3B03, and utilizes some of the concepts introduced in the heat and mass transfer courses. It is taught from a *generic* viewpoint; MATLS 4C03 provides a more specific analysis of modern iron and steelmaking and MATLS 4I03 focuses on sustainable materials processing.

This course provides the foundation for materials engineering students to work in the high temperature process industries. The course will emphasize production of metals, also discussing glasses and ceramics. The course will use examples of specific processes to develop an understanding of processing fundamentals. Students will learn how to apply these fundamentals to process analysis, design, selection, and operation.

In covering these topics students will develop certain aspects of the following CEAB Graduate attributes:

- Knowledge Base for Engineering
- Problem Analysis
- Investigation
- Design
- Impact on Society and the Environment

In addition to these attributes which will be taught applied and assessed, aspects of the following attributes will be applied and assessed but not taught:

- Communication
- Teamwork
- Ability to use Modern Engineering Tools

Course Learning Objectives:

By the end of the course students will be able to do the following (numbers in brackets refer to the Graduate Attribute Indicators):

1) Analyse heat and mass balance requirements during high temperature materials processing.
   i. (Problem Analysis 2.1 to 2.3)
2) Apply results of heat and mass balances to process design and selection, taking account of constraints imposed by chemical equilibria and environmental impact (through the project on process design).
   i. (Investigation 3.1 and 3.2, Design 4.1-4.3, Impact on Society and the Environment 9.1)
3) Quantitatively describe the operation of the major pyrometallurgical, ceramic, and glassmaking processes.
   i. (Knowledge 1.3 and 1.4)

Evaluation:

Evaluation Method:	Grade Distribution:	Deadlines:
Tutorial Assignments	15% (Total)	Stated on Assignments
Course Project	25% (Total)	February 14th & March 21st
Online Quizzes	10% (Total)	February 3rd & March 24th
Midterm Test	10%	February 17th
Final Examination	40%	April Exam Period

Mark Distributions:

- Six assignments will be released throughout the term; the top five marks will be taken into account for the total of 15%. The assignments are primarily designed to offer feedback; as such one-half of each assignment is marked based on completion and the other half on performance.
- The project is subdivided into Part 1 (10%) and Part 2 (15%). A performance improvement from Part 1 to Part 2 will results in changed weightings of 5% and 20%, *assuming an honest effort was made for Part 1*.
- Two online quizzes will be released to test students' theoretical knowledge (possibly with a small calculation component). There will be both time and attempt limits on these quizzes.

Laboratory Content

There is no lab component to this course.

Supplementary Texts:

A.K. Biswas and W.G. Davenport: *Extractive Metallurgy of Copper*, 3rd ed., Elsevier, 1994.

J.G. Peacey and W.G. Davenport: *The Iron Blast Furnace*, Pergamon, 1979.

T. Rosenqvist: *Principles of Extractive Metallurgy*, 2nd ed., McGraw-Hill, 1983.

B. Deo and R. Boom: *Fundamentals of Steelmaking Metallurgy*, Prentice Hall, 1993.

Other Available Resources:

Custom Courseware available in the Bookstore. Splitting a single copy between Project group members is highly recommended; it will be useful reference material for the Project, less so for the tested material.

Policy Reminders

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons involved, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Office, or the Human Rights Consultant as soon as possible.

The Senate Resolution on Course Outlines states that:

"…students should be reminded that they should read and comply with the "Statement on Academic Ethics and the Senate Resolution on Academic Dishonesty" as found in the Senate Policy Statements distributed at registration and available in the Senate Office."

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy: https://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf.

The following illustrates only three forms of academic dishonesty:

1) Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2) Improper collaboration in group work.
3) Copying or using unauthorized aids in tests and examinations.

Course Audit Checklist

Type of Activity	Brief Description	Significance (select one)
Tutorials (no new material)	Tutorials on industrial heat and mass balances	Major
Modelling Use of simple mathematical models or software packages.		Not Applicable
Use of Computerized Databases		Not Applicable
Design & Synthesis	Basis for the design of industrial processes	Major
Integration of Concepts (with other courses)	Follows 3B03, precedes 4C03 and 4I03	Major
Integrated Laboratory Experience		Not Applicable
Project (with essay, critical assessments)		Major
Illustration of Industrial Relevance (Visual Aids, movies, CD-ROM)	Videos and slides as appropriate	Minor
Team Projects (other than labs)	Team project on design of process route as a function of ore quality	Major
Methods/Components of Assessment	Tutorial/Assignment Questions Project (Part 1 & 2) Online Quizzes Mid-term Test Final Exam	Major
TA Utilization/Needs	TA assisting in tutorials and marking assignments.	Major