



A POLYTECHNIC INSTITUTION

School of Manufacturing, Electronics and Industrial Processes  
Program: Mechanical Engineering

**CHSC 2205**  
**Engineering Materials 2**

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<b>Start Date:</b>	January 4, 2006	<b>End Date:</b>	May 26, 2006
<b>Total Hours:</b>	80	<b>Total Weeks:</b>	20
<b>Hours/Week:</b>	4	<b>Lecture:</b>	2
		<b>Lab:</b>	2
		<b>Term/Level:</b>	2
		<b>Course Credits:</b>	5.5

**Prerequisites**

Course No.	Course Name
CHSC 1105	Engineering Materials 1

**CHSC 2205 is a Prerequisite for:**

Course No.	Course Name
MSYS 2380	Building Construction
MANU 3316	Advanced Materials

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**■ Course Description**

Continues from CHSC 1105. Selection of alloy steels, cast-irons, non-ferrous alloys, polymers, composites, concrete and ceramics for practical applications. Common causes of service failures are discussed, including fatigue, embrittlement and corrosion. Laboratory sessions emphasize mechanical testing, interpretation of microstructures and nondestructive testing.

**■ Evaluation**

Test 1	17.5%	Comments:
Test 2	17.5%	
Labs	25%	
Final Exam	40%	
TOTAL	100%	

### ■ Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

1. Recommend from a list of alternatives, appropriate ferrous and non-ferrous alloys for practical uses:
  - Categorize basic types of steels together with basic properties, common uses, industrial number designation. Steels considered include Plain Carbon, AISI Machinery (low alloy) Steels, Stainless, Tool and Die, Structural, Austenitic Manganese, and Maraging Steels.
  - Categorize basic types of Cast Irons together with basic properties, common uses and industrial number designation. Cast Irons considered are Grey, White, Malleable, Ductile, and Alloy types.
  - Describe properties and uses for alloys of aluminum, copper, magnesium, titanium, nickel and zinc.
  - Specify appropriate heat treatments for non-ferrous alloys.
2. Distinguish the structures, properties and applications of metallic and non-metallic materials including:
  - ferrous and non-ferrous alloys
  - plastics
  - ceramics
  - concrete
  - composite materials
4. To recognize the causes and recommend preventative measures for minimizing materials failures due to fatigue, creep, embrittlement, corrosion and processing defects.
5. To perform nondestructive tests at an elementary level and interpret the results.
6. Recognize nine corrosion forms and sketch simple cathodic protection circuits using sacrificial anodes or impressed current methods.

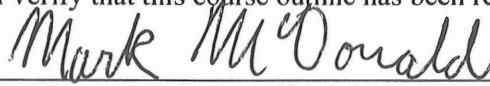
### ■ Verification

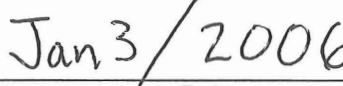
I verify that the content of this course outline is current.

  
\_\_\_\_\_  
Authoring Instructor: Lynn Erickson

  
\_\_\_\_\_  
Date

I verify that this course outline has been reviewed.

  
\_\_\_\_\_  
Program Head: Mark McDonald

  
\_\_\_\_\_  
Date

I verify that this course outline complies with BCIT policy.

  
\_\_\_\_\_  
Associate Dean: Paul Morrison

  
\_\_\_\_\_  
Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

### ■ Instructor(s)

Lynn Erickson	Office Location: SW1 – 1415 Office Hrs.: As posted	Office Phone: 604-456-1102 E-mail Address: lynn_erickson@bcit.ca
Mark Gendron	Office Location: SW1 – 1410 Office Hrs.: As posted	Office Phone: 604-434-5734 local 5769 E-mail Address: mark_gendron@bcit.ca

### ■ Learning Resources

**Required:**        **Engineering Materials 2 Lecture Notes (BCIT)**

**Laboratory Manual in Engineering Materials (BCIT)**

**Calculator: Sharp EL 520W (Required for tests and final exam)**

**Suggested:**    **“Engineering Materials Properties and Selection”, Budinski & Budinski**

### ■ Information for Students

The following statements are in accordance with the BCIT Student Regulations Policy 5002. To review the full policy, please refer to: <http://www.bcit.ca/~presoff/5002.pdf>.

#### **Attendance/Illness:**

In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with his/her instructor or Program Head, indicating the reason for the absence. Prolonged illness of three or more consecutive days must have a BCIT medical certificate sent to the department. Excessive absence may result in failure or immediate withdrawal from the course or program.

*Note: For technology programs, a student who is absent for more than 10% of the time prescribed for the course (for any cause) may be prohibited from completing the course and assigned a failing grade.*

#### **Academic Misconduct:**

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited and will be handled in accordance with the ‘Violations of Standards of Conduct’ section of Policy 5002.

#### **Attempts:**

Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from their respective program.

### Schedule

Week	Week Starting	CHSC 2205 LECTURE TOPIC (2hrs/wk)	LAB (2hrs/wk)	lab	SW1 room	Lab Groups
1	02-Jan-06	C. STEELS: Machinery, Stainless, Tool & Die	-	6	1075	-
2	09-Jan-06	HSLA, Structural, Hadfields' Steel, Steelmaking	Metallography	6	1075	ALL
3	16-Jan-06	Cast Irons, D. NONFERROUS ALLOYS: Precipitation	Case Hardening	7	*1075	#2
4	23-Jan-06	Hardening, Al, Cu, Ni, Mg, Ti, Zn overview	Case Hardening	7	*1075	#1
5	30-Jan-06	E. PLASTICS: Main types, Molecular structure, Polymerization	Precip. Harden.	8	*1075	#2
6	06-Feb-06	Isomers, Blends, Orienting, Weathering	Precip. Harden.	8	*1075	#1
7	13-Feb-06	Additives, Plastics forming methods	Plastics 1	10	*1075	#2, All Set A
8	20-Feb-06	F. COMPOSITE MATERIALS: Types, Test 1 prep.	Plastics 1	10	*1075	#1
9	27-Feb-06	Fiber/Matrix Interactions, Manufacture and Applic's	Test 1		1090	ALL
10	06-Mar-06	G. CONCRETE: Types, W/C Ratio, Degradation	Test 1 Review		1090	ALL
11	13-Mar-06	<b>SPRING BREAK</b>	<b>BREAK</b>	-	-	-
12	20-Mar-06	Reinforced & pre-stressed concrete	Plastics 2	10	1090	#2, All Set B
13	27-Mar-06	I. CORROSION: Basic cells, Reactions	Plastics 2	10	1090	#1, All Set B
14	03-Apr-06	Corrosion Forms, Measurement of Potential	NDT	11	1075	#2
15	10-Apr-06	Cathodic Protection	NDT	11	1075	#1
16	17-Apr-06	Anodic Protection, Design	Corrosion	-	1090	#2
17	24-Apr-06	Inhibitors, Coatings, Test 2 Prep.	Corrosion	-	1090	#1, All Set C
18	01-May-06	H. CERAMICS: Classification, Manufacture	Test 2	12	1090	ALL
19	08-May-06	Refractories, Glass Heat Treat, Toughening	Test 2 Review	12	1090	ALL
20	15-May-06	Review and preparation for Final Exam	Make-up week	-	-	-
21	22-May-06	<b>EXAM WEEK</b>	<b>EXAMS</b>			

\*1075: Meet in SW1-1075. Facilities in other labs (1540, 1090) may also be used during the session.