

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Winter 2020	
<b>Course Name</b>	Materials Technology	
<b>Course Code</b>	PROC TECH 4MT2	
<b>Date(s) and Time(s) of lectures</b>	Thursday 15:30-17:30	
<b>Program Name</b>	Automation Engineering Technology	
<b>Calendar Description</b>	This course covers classes of engineering materials, their important properties and applications. Topics include: metals and alloys, stress and strain, plastics and elastomers, ceramic materials and selection of a material for an application.	
<b>Instructor(s)</b>	Doris Clayton	E-Mail: claytodb@mcmaster.ca

### 2. COURSE SPECIFICS

<b>Course Description</b>			
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	26
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
	<b>Total Hours</b>		26
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN: 978-1-119-40549-8	Materials Science and Engineering: An Introduction, Enhanced eText, 10th Edition	William D. Callister David G Rethwisch
	<b>Other Supplies</b>	<b>Source</b>	
<b>Prerequisite(s)</b>	ENGTECH 1CH3, 1PH3		
<b>Corequisite(s)</b>			
<b>Antirequisite(s)</b>			
<b>Course Specific Policies</b>	<p>The first term test will cover the material from Modules 1 to 4 inclusive. The second term test will cover the material from Modules 5 to 7 inclusive. The final exam will cover all course material.</p> <p>Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course.</p>		
<b>Departmental Policies</b>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of "out-of-class" work for every scheduled hour in class. "Out-of-class" work includes reading, research,</p>		

	<p>assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>
<b>3. SUB TOPIC(S)</b>	
Week 1	Chapter 1: An introduction to materials science and engineering; the main classes of materials and their historical significance
Week 2	Chapter 2: Review of atomic and electron structure; primary and secondary bonds in materials
Week 3	Chapter 3: Crystal structures of metals; crystallographic planes and directions
Week 4	Chapters 4 & 5: Solidification of metals, crystalline imperfections (vacancies, grain boundaries and dislocations); solid-state diffusion and carburization
Week 5	Chapter 6: Mechanical properties of materials (strength, hardness, ductility, toughness); the engineering stress-strain diagram
Week 6	Chapter 8: Failure of engineering materials: fracture and fatigue
Week 7	Chapter 9: Phase diagrams of pure materials; binary alloy phase diagrams; Lever Rule calculations
Week 8	Chapter 10: The TTT diagram and the heat treatment of steels; hardenability
Week 9	Chapter 10: Annealing; precipitation hardening of aluminum alloys
Week 10	Chapter 11: Ferrous and non-ferrous alloys and their use in engineering applications
Week 11	Chapter 11: Composition, structure and processing of ceramic materials; mechanical properties and applications of ceramics
Week 12	Chapter 12: Composition, structure and processing of polymers; mechanical properties and applications of polymers
Week 13	Chapter 12: Composition, structure and processing of composites; mechanical properties and applications of composites
<p><b>Classes end: Tuesday, April 7 2020</b></p> <p><b>Final examination period: Monday, April 13 to Tuesday, April 28 2020</b></p> <p><b>All examinations MUST be written during the scheduled examination period.</b></p>	
<p>Note that this structure represents a plan and is subject to adjustment term by term.</p> <p>The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>	
<b>4. ASSESSMENT OF LEARNING</b>	
	<b>Weight</b>
Assignments (3)	17
Mid-term test #1 (Week 6 approx.)	24
Mid-term test #2 (Week 11 approx.)	24
Final examination (tests cumulative knowledge)	35
<b>TOTAL</b>	<b>100%</b>
Percentage grades will be converted to letter grades and grade points per the University calendar.	

## 5. LEARNING OUTCOMES

1. List the main classes of engineering materials and identify some of their important properties and common applications.
2. Discuss the types of bonds and crystal structures found in engineering materials and relate these to their physical and electrical properties.
3. Describe and illustrate solidification processes, nucleation, grain structure, metal alloys, solid solutions, crystal imperfections, diffusion, and the effects of elevated temperatures on the structure and properties of metals.
4. Describe and illustrate basic methods of processing metals and alloys into useful shapes. Identify specific alloys used in engineering applications.
5. Define the important mechanical properties of materials (strength, ductility, hardness and toughness) and understand how these properties may be derived from the engineering stress-strain diagram.
6. Discuss the failure of materials due to fracture and fatigue
7. Use phase diagrams to determine compositions and relative amounts of phases under different conditions and apply phase diagrams to the heat treatment of alloys.

## 6. POLICIES

### Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

[http://www.mcmaster.ca/policy/General/HR/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

### Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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, located at: <http://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 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.

### Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for Undergraduate Students to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
  - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
  - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final

examination or its equivalent.

- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:
  - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

### **E-Learning Policy**

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

### **Communications**

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

### **Turnitin (Optional)**

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

### **Protection of Privacy Act (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality. <http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

### **Academic Accommodation of Students with Disabilities Policy**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

### **Student Code of Conduct**

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>