

MEASUREMENTS
CHEM ENG 2I3
WINTER TERM 2011/2012

COURSE OBJECTIVES: This course acquaints students with the principles of measurements as it pertains to engineering applications. Topics will cover important aspects related to sampling, error analysis, calibration, and data interpretation, as well as familiarize the student with the measuring technologies typically used in Chemical Engineering. Understanding the relevance of measurements collected from different types of physical sensors will be developed through lectures covering operating principles and reinforced through lab experiments.

INSTRUCTOR:

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TEACHING ASSISTANTS:

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LAB STAFF:

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SCHEDULE: Lectures: HSC/1A6 – Mon., Wed. 8:30 – 9:20,

Lab: Sections (all labs are in JHE 254)

L01/L02 Mon. 14:30 – 17:20 (EOW)

L03/L04 Tues. 14:30 – 17:20 (EOW)

L05 Wed. 14:30 – 17:20 (EOW)

RESOURCES: Required Texts

R.S. Figliola, D. E. Beasley. Theory and Design for Mechanical Measurements. 4th ed., Wiley and Sons, NY, 2003 (5th edition 2010 is acceptable too if the bookstore gets it)

M. R. Thompson, ChE 2I03 **Measurements** Courseware 2012

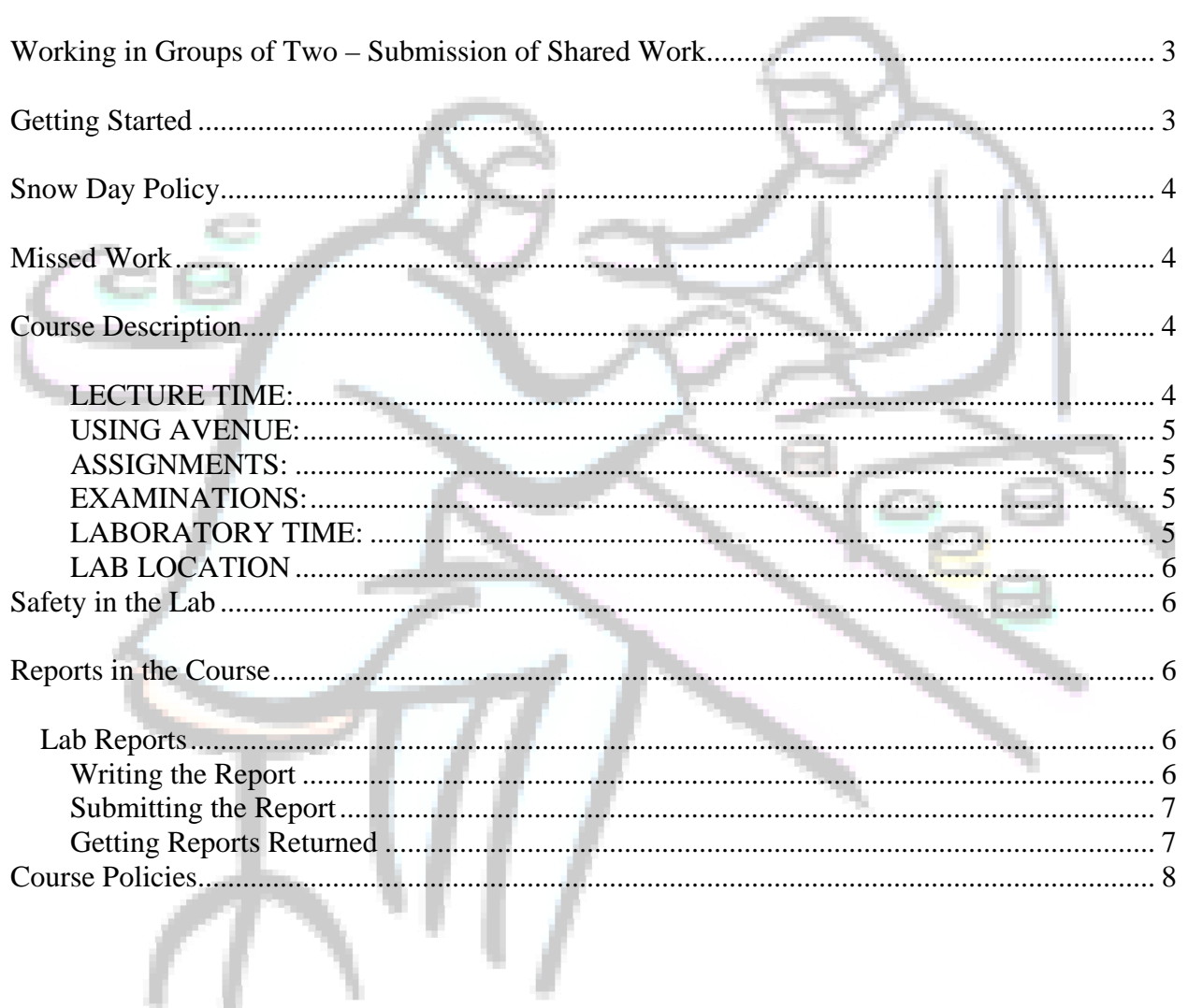
GRADE SCHEME*,:**

		Final Grade
Lecture	Mid-Term (during lecture time, Monday Feb 6 th , 2012 in T28/001)	20%
	Final Exam	55%
Laboratory	Lab Report (3) – individual work or work of 2 students.	15%
Assignments	Assignments (3) – individual work or work of 2 students	10%

* The instructor reserves the right to alter the evaluation scheme if necessary.

** Grading will be determined from the instructor's gradesheet not marks listed on AVENUE. In the case of discrepancies between the two, the marks on AVENUE will be disregarded.

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General Comments

A website has been set up under the Department of Chemical Engineering's URL: chemeng.mcmaster.ca. The site may be used to provide tools to assist in writing the laboratory reports, learning the use of statistics in laboratory studies, addendums to laboratory experimental procedures, forms, etc. The site also maintains the most up-to-date course outline. It is from that outline which this course will be evaluated. Course notes and original lab procedures will only be found in the courseware.

The overall percentage for the course will be converted to a letter grade using the scale recommended by the Office of the Registrar. The instructor reserves the right to adjust marks up or down. Graded reports will be kept in the department for a minimum of one year, in accordance with Senate regulations.

Specific Note on E-mail

This course communicates through your McMaster e-mail account (not avenue). It is important that your account maintain sufficient free space at all times to accept e-mails from the instructor and TAs. Return of reports, grades, or even communication in regards to missed work forms will only be sent once. If they are rejected by the account of the student due to it being full, the responsibility lies with the student to remedy the missed communication. In the case of an email reply to a McMaster Student Absence Form (MSAF) which stipulated a new deadline for the missed work – the assignment/report/makeup quiz will still be considered late after that new deadline passes, even though the student did not receive notification because their email account was full.

Working in Groups of Two – Submission of Shared Work.

The instructor of this course fully supports the importance of engineering students learning to work in groups. But there are often problems with everyone contributing equally to that work as the group grows large in size. As a result, for this course, I will permit two – and only two – students to work **on either an assignment or report together**. In such cases of working together, it is important that proper acknowledgement be given. A form, Group Declaration page, must be downloaded from the course website on AVENUE and must be attached to the front of a submission with the signature of both persons shown. No signature – no grade to the second name on the work (left to right, or top to bottom). Signatures can not be added after marking either.

One other important point – only ONE copy of an assignment or report may be submitted for a group. A second copy with or without the declaration page will be treated as an example of academic dishonesty.

Getting Started

At the start of term, the first week of lecture always precedes the laboratory experience. The first lecture provides information on how the lectures and labs will proceed and gives instructions on

your safety in the labs. In addition to attending the first lecture, what should you know to start out in the course:

1. Purchase the courseware and required textbook from the Bookstore
2. **Find out what labs you will be doing from the laboratory schedule. This schedule is usually available on the course website. But not till the second week of term.**
3. Ensure that you have safety glasses and goggles

Come to the first lab with your courseware and having read the procedures for your experiment. Delays will make it difficult to get the data needed to write the report and the lab room does not stay open past its three hour period.

Snow Day Policy

As this is a winter course, a snow day is always a possibility. In the event that an **official** snow day is called by the university, the following applies:

Due Laboratory reports – due the first day back at 4:00 PM

Missed Lecture – instructor will adjust schedule and inform students at next class

Missed Assignment – due the following lecture day, before 4:00 PM

Missed Lab – instructor will discuss this during the next lab time

Missed mid-term – instructor will coordinate with the registrar to reschedule and inform the class as soon as possible.

Missed Work

Any missed work in this course (mid-term, assignment or lab) will be exempt upon receiving a McMaster Student Absence Form (MSAF); see comments on MSAF and e-mail above. **The grade value of all missed work will be added to the value of the final exam** so that the missed work will be made up through empirical assessment of learnt knowledge.

*A MSAF must be received within a span of two-weeks or before the examination ban, whichever is shortest. **No MSAF will be accepted once the lectures have ended for the course.*** Students are reminded that it is the policy of the Engineering faculty that students are responsible to follow up with the instructor directly once filing an MSAF, and ensure it was received. This is important since often students may enter the wrong e-mail address for the instructor and the MSAF will never be received. It is not the responsibility of the instructor to follow up on such matters.

Course Description

LECTURE TIME:

Two 50 minute lectures per week. Topics cover the technical aspects of data collection, data analysis, sensor operation and measurement/sampling error. Students are expected to follow the lectures and read appropriate chapters in their required textbook. Not all important information about a topic can be conveyed through the lecture period. **All content from the lectures and indicated chapters of the textbook (see courseware) will be covered in the examinations.**

USING AVENUE:

This course uses the university's AVENUE e-learning software to allow communication between the students, and to provide access to grades. Marks posted on AVENUE are given for information purposes only – the final grade of the course is determined from the instructor's gradesheet. It is important that students understand how the system is used by the teaching staff to avoid problems throughout the course.

The instructor (and possibly the TAs) will use this medium to communicate announcements and provide grades on a monthly basis.

Neither the e-mail nor discussion board features are monitored by the teaching staff. The discussion board is intended for students to collaborate on their reports. Report any misuse of the board to the instructor.

DO NOT send reports/assignments to the teaching staff by AVENUE – they will not be received and will be TREATED AS LATE, being penalized for the delay till they are sent properly. Use the McMaster e-mail addresses mentioned at the start of this outline for submitting reports.

ASSIGNMENTS:

There are three assignments for this course. They primarily give students experience with the few calculations required in this course. Assignments are to be handed in on their due date at the time of lecture or to the dropbox in front of the departmental office (JHE 374) before 4pm. The dropbox is emptied each day at exact 4pm. The assignment can be downloaded from AVENUE along with data files (if required) and in some cases, examples. An assignment may be one day late and be accepted with a penalty of 10%. No work will be accepted following that extra day (see Missed Work policy above). **See the topic on Pg 3 regarding working in groups if applicable.**

EXAMINATIONS:

There is a mid-term with a value of 20%. The final exam is worth 55%. The mid-term and final exam will contain true/false, multiple-choice and short answer questions. All answers will be provided directly on the exam sheet. Students may only bring to these tests a McMaster University-approved calculator, pens, pencils and erasers. There is no make up mid-term for this course (see Missed Work policy above).

LABORATORY TIME:

Each student will take part in three (3) in-lab experiments of three hour duration. A lab station will be assigned to a student prior to the start of the labs. Due to the limited space of the room, students can not attend a lab time which they were not assigned.

The purpose of the lab is to gain practice experience with data collection, sampling, calibration and use of sensor. Participation in the laboratory at all times is mandatory. Students can not write a report if they did not attend the lab since the grade of the report is in part a reflection of the experienced in the lab. 3-5 students will work at a lab bench.

Note on time: The lab room is to be **closed at the end of the 3 hour period (no exceptions)**. Appropriate time management skills are important to an engineer.

DO NOT copy any data from other students outside your group or from any other sources – see discussion of Academic Dishonesty at end of course outline.

LAB LOCATION

All lab experiments are conducted in JHE 254. The room has a capacity for 25 persons and to accommodate the class, students will note their scheduled times alternate every other week, as indicated on MUGSI. Students will be asked to leave the lab if showing up on a day not scheduled to them.

Safety in the Lab

It is essential that all students work in a safe environment. Guidelines on Laboratory Safety are listed in the courseware for this course. As well, two lectures on safety will be given during the lecture time. Safety glasses (or goggles depending on the lab) are required in the laboratory at ALL times. At all times during the proceedings of the lab, a student must behave in a safe, responsible manner. No cell phones or texting devices are allowed in the lab area as they distract and potential interfere with equipment – see note at end of this outline concerning these devices in greater detail.

Safety infractions will normally be dealt with as follows:

- First infraction – oral warning
- Second infraction – written warning
- Third infraction – failure on that laboratory
- Fourth infraction – withdraw from the course

This order may not be followed depending on the seriousness of the student's action and will be left at the discretion of the instructors of the course.

Reports in the Course

Lab Reports

There are three lab reports for this course in total. Though the student works in a group while performing the experiment, the report must demonstrate the individual work of the student (or for a group of two). **DO NOT** submit group lab reports comprised of everyone at the lab station with you, else the total mark will then be divided by the number of names on the lab and given to each member accordingly. Copied text between reports will be treated as academic dishonesty. Only figures and tables may be shared.

Writing the Report

The report is expected to present your results (tables or graphs), provide a comparison of how your data confirms or opposes theoretical expectations, and should give a clear, concise discussion of your results including an analysis of error. Figures must be easily read and few

tables should be given. **Do not repeat the same data in a figure and a table for the same report** – that’s wasting space. The page limit specified below is set to motivate students to write in the most concise manner possible. **Markers will not read any content past the specified 4-page limit.**

Each report will consist of a:

- Cover page (experiment title, date, first & last name of the authors, followed by a list of names of persons involved when the experiment was conducted)
- Introduction (a statement of purpose for the experiment and objectives to be completed)
- Results & Discussion (answering the questions in the lab manual)
- Appendices (may be included to hold raw data but will receive no grade)

MAXIMUM LENGTHS:

Introduction: 0.5-page limit, double spaced text using a 12-point Times New Roman font.

Results & Discussion: 3.5-page limit including tables and figures), double spaced text using a 12-point Times New Roman font.

The *report* may not exceed 4 pages total when tables and figures are added – this count does not include the cover page or the group declaration page. *Markers will not look at any page after the limit for determining grades.* Experimental, Abstract, or Conclusion sections are NOT to be included. Appendix data will receive no grade either.

Figures included in the report body or appendices should be numbers chronologically. Figures should have no box around the entire graph (which is the default of copying plots from Excel), the axes must have descriptive labels and state the units of measure. Data collected and plotted is to be shown as symbols in the graph. Lines may only be shown in the graph for regression fits, no lines between symbols is permitted – its poor formatting.

Submitting the Report

A hardcopy of the report is to be stapled together (no special binding please) and submitted to the departmental office (either to the administrative assistant or to the dropbox in front of the office) by 4:00 PM. **EACH REPORT IS DUE ONE WEEK AFTER THE LAB EXPERIMENT.** The name of the student submitting the report must be clearly indicated. **If two students worked together then you must submit the Group Declaration form as well (see mention back on Page 3).**

Failure to hand in the report on time will result in a penalty of 20% per day late, with first day late starting after 4pm the day it was due.

Getting Reports Returned

A gradesheet will be returned with the report to explain the mark and includes comments.

Course Policies

Recording devices in lecture and labs – No video/image recording devices are allowed in the lecture hall and tutorials without written permission by the instructor.

Cell Phones and Texting Devices –

In Lecture:

- Neither phones nor texting devices may be used in lectures as they are distracting and can disturb others. Students are required to leave the room if they must be used.

Lab:

- **Absolutely no electronics may be brought into the actual lab area by a student. They may interfere with other devices in the lab and may distract a person, leading to a hazardous situation. Use of these devices in the lab or repeated use outside the lab during the lab period will result in a loss 5% off of their report grade due to lack of participation on that day (this penalty can accumulate due to repeated infractions).** Ask the instructor if this is not clear to the student.

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 concerned, individuals are reminded that they should contact their Department Chair or the Sexual Harassment - Anti-Discrimination Officer, as soon as possible.

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines or 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 for comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and note any changes.

Academic Integrity:

You are expected to exhibit honesty 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 the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

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.*

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines or 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 for comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and note any changes.

SPECIAL NOTE: *The electronic version of this course outline posted on AVENUE is the most up to date and supersedes any content in the courseware which is often out of date before the course starts.*

