Faculty of Engineering
McMaster University
September 2023 – April 2024

MECH ENG 3M03

Mechanical Engineering Composite Labs – 3rd Year
COURSE OUTLINE and GENERAL INSTRUCTIONS

Purpose of ME 3M03

The Composite Laboratory course is designed to give students an appreciation of experimental techniques used in mechanical engineering. The experiments demonstrate how useful engineering information can be extracted from a series of well-planned tests.

Learning Outcomes: Upon successful completion of the course the students will be expected to have demonstrated the ability to:

1. Understand fundamental experimental techniques in mechanical engineering.
2. Perform experiments to extract useful engineering information.
3. Understand basic machine shop operations with hands-on skills.
4. Analyze experimental data and present in usable form.
5. Reach sound conclusions from well analyzed data.
6. Write-up formal engineering reports.

Graduate Attributes: This course provides the students opportunity to develop the following measures of graduate attributes:

Graduate Attributes
2.1 Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem.
2.2 Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions.
3.1 Selects appropriately from relevant knowledge base to plan appropriate data collection methods and analysis strategies.
3.2 Synthesizes the results of an investigation to reach valid conclusions.
5.1 Evaluates engineering tools, identifies their limitations, and selects, adapts, or extends them appropriately.
5.2 Successfully uses engineering tools.
7.1 Demonstrates comprehension of technical and non-technical instructions and questions.
7.2 Composes an effective written document for the intended audience.

Organization

The experiments will be performed by small groups of four to five students. Students registered in the ME 3M03 course are required to complete three machining lab experiments and three additional full labs in the first semester, and five full labs in the second semester. The three machining labs will be counted as two full labs in computing the final grade. The students will perform the in-lab experiment the first week and do the assignment based on the lab in the following week in a write-up session. For the machining labs, the students will do the labs in the machine shop on three consecutive weeks, and do one assignment the following week. In addition, each student will submit a FULL lab report for one lab in each semester. The list of the laboratory groups will be posted on the course web site.

Advance Preparation for Labs:

- Students are **REQUIRED** to prepare for each lab by reviewing the lab materials in advance.
- All of the preparation materials are available online including:
    - the printable lab handout,
    - an online prelab presentation,
    - video lecture and
    - general safety information including lab floor plans.
- To ensure compliance all students will perform an online quiz (10-15 questions) for ALL labs.
    - **Any student who does not achieve 100% on the quiz will not be permitted to attend the lab and will be given a zero for the lab.**
    - The quizzes are composed of simple multiple choice and true-false questions that are meant to test if the student has reviewed the material.
    - Multiple quiz attempts are permitted. However, **a grade will be assigned on your FIRST attempt, which will be weighed as 10 percent of the overall grade**.

For the **MACHINING LABS**, the students will **ALSO** do a pre-lab quiz. This is based on **ALL** four videos which is mandatory viewing for all. A mark of 100% is required on the pre-lab quiz for the student to attend the machining lab.
During the lab, teaching assistants will be present to help the students to understand and interpret the results but the students are expected to perform most experiments on their own.

Changes to lab schedule and due dates require a MSAF and must be re-scheduled with the **Course Instructor**.

Assignments and Lab Reports:

All students must attend an assignment write-up session the week following the in-lab session. At the write-up session, the students will be handed an assignment that must be completed and handed in at the end of the write-up session. Please bring in all your data, plots and any other information that will be needed to complete the assignment. The assignment will be done individually by each student, and it will be closed book. The assignment for the Machining lab will be done "at home" and submitted electronically to AVENUE..

Full Lab Report: For those doing the full lab report for the week, an electronic PDF copy of the final full lab report must be submitted to AVENUE one week after the write-up session for the lab.

IMPORTANT: All final lab reports will be submitted to Turnitin.com to check for evidence of copying or plagiarism. Any labs found to have a significant copied or plagiarized component will be given a mark of zero and additional action may be taken. (See statement on Academic Dishonesty)

Grading Scheme:

Pre Lab Quizzes	10
Assignments	60
Full Lab Reports	30
TOTAL	**100**

Minimum Requirements to Pass the Course

1. Attend and complete all the scheduled labs
2. Attend and complete all scheduled assignments
3. Achieve at least 50% on the full lab reports.

HEALTH AND SAFETY

The Department of Mechanical Engineering is committed to McMaster's University Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs".

It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at:

http://www.workingatmcmaster.ca/rmm/

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.

SENATE AND THE FACULTY OF ENGINEERING POLICIES

"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 the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible."

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 on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

Plagiarism Detection: In this course we will be using a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. Students will be expected to submit their work electronically either directly to Turnitin.com or via Avenue to Learn (A2L) plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

"The instructor and 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. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes"

Report Grading

The emphasis of the full lab report is in the analysis and presentation of the experimental data, discussion of the results and the answering of questions contained within the laboratory write-up. The laboratory reports should be submitted with an appropriate title page, with your name, MAC ID, student number and lab group clearly on it. Reports must be type written with a formal tone and appropriate figures and tables to support the report (see below). Electronic copies must be submitted as non-encrypted PDF files. Please consider that your audience for the report is not the TA (i.e., imagine it is the Chair of the Department). In that case, it is important to provide a report with a professional appearance and a suitable background and explanation for all components of the report. The report will be graded as such.

The following components must be included with every lab report (except the "Theory"). The sections outlined here are associated with the grading rubric.

A) Title Page, Objective / Procedure, References [out of 2]

Title Page:
Every report requires a title page that identifies the experiment name and number, the name of the TA, the date the experiment was performed, the laboratory group number and the students' names and student numbers. A title page is required to properly identify and track the report for grades.

Theory: [**Not required]** The theoretical background for the experiment is contained within the laboratory instructions. Though typically required in scientific papers, the student will not be required to reproduce the background theory in the lab report.

Objective: The report **must** paraphrase the objective of the laboratory. A copy of the objective verbatim from the laboratory instructions is not suitable and the appropriate deduction will be made.

Procedure: [**Note**: only required if deviations are made to the experimental procedure from the lab instructions] It is not required to reproduce the procedure if followed as in the lab handout. However, **all deviations from the** written experimental procedure must be carefully documented as this could affect your results and will need to be discussed.

References
All external sources used for the write-up, including texts, websites or articles from learned journals, must be properly cited. Failure to properly reference external sources is considered to be a significant breach of professional ethics and will be treated as such.

B) Results [out of 8]

-It is necessary to submit raw experimental data for the TA to check. It is suggested that you present this in neatly tabulated form wherever possible.

-Tables should be sequentially numbered, as they may have to be referred to in the Discussion. Though handwritten tables filled out during the laboratory session are acceptable for this purpose, they must be neat and any handwritten tables must be scanned so that they can be incorporated into the electronic version of the report.

-Students are encouraged to construct tables for the laboratory session prior to the start of the lab as part of their pre-lab preparations. The Teaching Assistant will advise you on the most suitable format for the particular laboratory should this not be the case.

-Students will be required to submit sample calculations for the processing and analysis of the experimental data for one test run for the Teaching Assistant to check them. Note: failure to submit sample calculations

will result in significant deduction from the laboratory grade should the calculations be incorrect.

-All write-ups will require some form of presentation of the experimental results in a comprehensible form; typically graphs or data tables derived from the data taken during the laboratory session and from calculations performed using the experimental data. As stated previously, Figures and Tables must be numbered sequentially and be referred to by this number in the Discussion section. The Teaching Assistant will advise you on the most suitable format for presentation of the experimental results for the laboratory. It is important that all measured quantities be quoted in their proper units.

C) Discussion [out of 12]

-The Discussion is the most important part of the report. Appropriately, the mark for the Discussion represents the single greatest component of the report grade.

-The mark will reflect your ability to critically analyze the various aspects of the experiment (e.g. agreement of your results with theory, sources of error, shortcomings of the apparatus or your experimental technique) and to draw reasonable conclusions from the data. This is also the section in which you will be required to answer the question(s) contained within the laboratory instructions. Your TA will give you some specific guidelines on the points upon which you should focus in this section.

D) Conclusions [out of 4]

-A short concluding section should accompany every report in which the results are summarized for the benefit of the reader and any recommendations are made.

E) Spelling, Grammar, Effective Writing: [out of 2]

Proper spelling and grammar is always important when writing an engineering report. Deductions will be assessed for poor spelling, grammar or poor writing style.

F) Report Organization: [out of 2]

Reports must be organized in a logical manner that is easy to read with legible tables and figures. Remember that your audience does not necessarily know the topic or the background to the experiment. Help them to understand the findings with a well-written report.