

MCG1100 Mechanical Dissection Labs Design Report Requirement

As part of the requirements of MCG1100, you must prepare a brief report on a mechanical device, system or structure, commenting on its design, function, materials and manufacturing. The subject of the report can be a household appliance, a machine from a workshop, factory or construction site, part of a vehicle, or a museum exhibit. Students in biomedical mechanical engineering may wish to select a medical or rehabilitation device, but parts of the human body are not acceptable subjects.

1. Choice of Topic: The object that you choose as the topic of your report:

- should be a mechanism or mechanical system with a reasonable degree of complexity: it should have at least 4 working parts, not including screws and other fasteners. A static structure with no moving mechanical parts is not acceptable.
- must be taken from **outside** the class - you may not do a report on an object in the collection in the design lab.
- must be an object that you have personally examined. **It is not acceptable to report on a device that you have merely looked up on the web or in a book.** You may of course use information from other sources, but the majority of the report must come **from your own investigation of the object.**
- **may not be any of the following objects:** car jack, blender, bicycle, corkscrew (wine bottle opener), stapler, hair dryer, tea kettle, curling iron, nail clippers, scissors, drawing compasses, desk lamp, electric fan, pliers, electric motor, scooter. Also not allowed are objects covered in the labs: computer hard drive or floppy drive, gasoline engine, electric drill, sabre saw.

Suggestions for design report topics:

- household appliances: mixer (hand or power), meat grinder, power tool, mechanical pencil sharpener, push type lawn mower (not a power mower), computer CD/DVD drive, VCR or DVD player drive, mechanical camera (NOT digital), mechanical clock
- toys: drive system in powered toys (cars, robots), nerf gun, model locomotive
- automotive or other transportation systems: differential (but not a whole transmission - too complex), disk or drum brake, window operating mechanism, windshield wiper drive, steering mechanism, suspension, steam locomotive mechanism
- sports, rehabilitation or medical diagnosis equipment, such as exercise machines, bicycle brake systems, prostheses or artificial limbs, equipment for physiotherapy
- musical instruments: piano action, organ action (mechanical, not electronic), woodwind key systems, actuators for percussion instruments

This list is not exhaustive, and you are free to pick other objects that meet the criteria given. It is recommended that you select an object that you can dissect so that you can properly examine its parts. You do not need to get your topic approved, but if you are not sure whether your proposed subject is acceptable, please ask your instructor by e-mail by 25 January. You will receive an e-mail in response.

2. Report Elements: The report must contain:

1. photographs of your subject **with its parts labelled**. These must show the reader how the device works. You may also include sketches if you wish to help in explaining the mechanism; sketches are optional, but the photographs are mandatory. **The photos must be taken by you**, not downloaded from the web.
2. at least two free-body diagrams of **parts** in the device; these should be significant load-bearing components, not merely two-force members. The FBD's must show components which are different in function; for example, individual gears in a train of gears would have almost identical FBD's, and would not count as more than one FBD. Free-body diagrams must include a table identifying all the forces shown (*e.g.* F_A = force on point A).
3. a writeup (2-3 pages) containing the following information:
 - (a) an introduction, stating what the device is used for;
 - (b) a description of how the device works, referencing the photos and sketches;
 - (c) a listing of the materials used for major parts, and the manufacturing processes used to produce the parts. You must state *how* you have identified the materials and processes, and show **that you have used the methods learned in class to do this**.
 - (d) comments on the design: why are the device and its parts designed as they are, why were certain materials and manufacturing processes chosen, and how the design could be improved.
 - (e) one or more references to an outside source of information, in addition to the lab manual for the course, which should be one of your references. See §5 for more information on references

3. Form and Style: The following style guidelines, common to most formal engineering reports, must be followed:

- must have a title page which includes your name and student ID
- must be typed double-spaced in an 11 or 12 point font
- must be arranged in logical sections with numbered headings and sub-headings
- the passive voice rather than the active must be used (“The screws were removed..”, not “I removed the screws ...”)
- the report must be written in full sentences: point form is unacceptable
- slang, colloquialisms, or text message abbreviations are not acceptable
- a brief conclusion should be written at the end, stating the most important points you have learned from this device. No new information should be presented in the conclusion.

The report should be complete, yet concise. **It must not be more than six pages long** including all diagrams (but not the title page). Any exceptions to the page limit must be approved by the

dissection lab instructor. Reports will be marked on the quality of the contents, presentation and explanations, not the amount of verbiage delivered.

4. Figures: Photos, diagrams and sketches must conform to the following guidelines:

- all figures, photos, graphs, diagrams and tables must have captions (*e.g.* Fig. 1: Sketch of mechanism showing parts)
- scans of diagrams and sketches must be of good quality. They must be properly lit and saved at a high enough resolution that text and details can be read. Use a proper scanner; a cell phone does not make a good document scanner.
- subjects must be properly lit when taking photos; lighting must be arranged to show the details that you are discussing. Generally speaking, a flash should *not* be used.
- all figures taken from other sources must be given a reference (see next section)
- parts discussed in the text must be labelled on the figures (see example §8)
- each figure should be embedded in the report close to the text that refers to it: the figures should not be in an appendix. They should also not be grouped at the start of the report: the report should begin with text. Figures should be oriented so that they can be read without rotating the page.

5. References: Any material taken from other sources, whether quotations, figures, or special information, must be so marked and given a reference. **If you do not do this, you are committing plagiarism, and you will be subject to sanctions for academic fraud** (see more information on plagiarism in §9). The purpose of references is to allow your reader to find the original source of information used in your report. They must be used in all instances in which text, drawings or other information from another source are reproduced. You must include one or more references to an outside source of information; one of these must be the lab manual for the course.

The two most common formats for references in engineering are:

(a) the author/date system: the work is cited in the text as Blow and Snow (1996), or, if there are more than two authors, as Smith *et al.* (1993). Examples:

The clearance between the cylinder head and piston in this type of engine is small (Smith and Bloggs 1957).....

According to Smith *et al.* (1993), the bolts must be tightened in the correct sequence...

The works cited are listed in the list of references at the end of the report in alphabetical order by first author. This is an example list of references with typical formats for different kinds of sources:

Smith, A., Jones, B., and Bloggs, W. (1993), High temperature decomposition of lab reports, *Canadian Journal of Chemical Engineering* **volume no.**, page.. (for a paper or article in a journal, newspaper or magazine)
 Blow, J., and Snow, M. (1996), Toxic emissions from incineration of lab reports, *Conference on Incineration*, Toronto, page no. (for a paper from conference proceedings)
 Étudiante, A., and Schueler, M. (2001), *Handbook of Lab Report Recycling*, University of Ottawa Press, Ottawa. (reference to a book. If you want to refer to a specific page in the book, do it in the citation in the text: "Smith (2001, p. 345) shows that...")

(b) the number system: the work is cited in the text with a number in square brackets (*e.g.* [4]). The

numbers are assigned in the order in which the works are first cited, and the works are listed in numerical order in the list of references. If a work is cited more than once, the same number is used for each citation. Citations take up less space in the text with this system, but the disadvantage is that if you revise the manuscript and add more references, any following new references may have to be re-numbered. Examples of typical number system citations:

The main rod is usually provided with fittings so that grease can be forced in [4, 5]...

According to Smith and Bloggs [6] cast iron piston rings are used....

Here is a typical reference list in the number system, with sample formats for other types of sources

[1] Ingenious Devices Inc., instruction manual for Type X pressure transducer, 2014. (reference to a book or manual for which no author is given - give the company name as the author)

[2] U n i v e r s i t y o f O t t a w a (2 0 1 6) , A c a d e m i c I n t e g r i t y , <http://www.uottawa.ca/vice-president-academic/academic-integrity>, accessed 13 April 2016. (reference to a web document: give the author or institution, the URL and the date you accessed it. However, a journal or conference proceedings paper obtained from the web should be referenced as above for journals and proceedings)

[3] Chrétien, J. (2002), personal communication. (reference to information obtained from an individual person).

Note that in either system a citation of the reference (either author/date or number) must be **given at every location in the report where the material is reproduced. It is not enough just to list references at the end of the report.** Note also that every publication listed in the list of references **must be cited somewhere in the report.**

6. Example: The following is an example of how to describe the workings of a mechanism, complete with a properly labelled diagram, an example reference and figure caption. Note that the entire paragraph is quoted from the reference, and is therefore indented and offset from the report text. Shorter quotations should be enclosed in quotes (“ ... ”).

In *Stephenson's Link Motion* (Fig. 1) the eccentric rods A B are connected to either end of a link C, curved to a radius from D. The valve spindle F supports a die E capable of vertical movement relatively to link C, such movement being controlled by the lifting link G. If the reversing rod H be moved to the right, the rocking link J will lift the radius link until rod B is nearly level with the valve spindle, and the valve then receives almost all the horizontal movement of B, while A's motion is all but inoperative on the valve (Lineham, 1912).

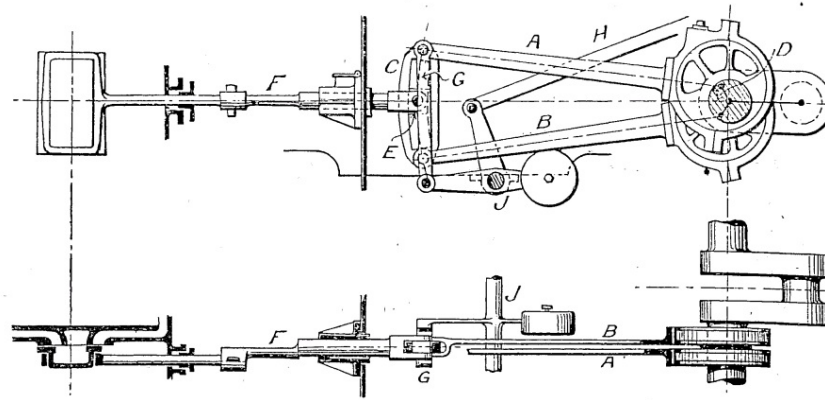


Fig. 1: Stephenson link motion (from Lineham, 1912)

At the end of the report:

List of References:

Lineham, W.J. (1912), A Textbook of Mechanical Engineering. Chapman & Hall, London.

7. Submission: The report must be submitted electronically **as a single file in PDF format** to the Blackboard site for the course - it will appear there as an assignment. Do not submit multiple files, zip files, doc files, etc. The file name must have the following format: 1234567 MCG1100 Report 2016.pdf, where 1234567 represents your student number. Files submitted in the wrong format will be returned to you for correction and re-submission, and will incur a 10% penalty in the grade.

The file size submitted should be less than 2 MB. If your file is larger than this, it will incur a 10% penalty in the grade. The most common reason for large files is that figures have been saved at too high a resolution. To reduce the size of .jpg figures, use Resize in Windows Paint, or use Edit-Resize in MS Office.

The deadline for submission is given in the course outline. **Late submissions will have the grade reduced by 10% for each working day late or part thereof.**

8. Grading: This report will be used to document contributions by this course towards the Graduate Attributes required by the Canadian Engineering Accreditation Board for accreditation of engineering programs. An explanation of accreditation and the graduate attributes system is found in a separate document on the Blackboard site for this course. The marking is therefore broken down into the different Graduate Attributes for accreditation of engineering programs:

1. Knowledge base for engineering	13
- correct free-body diagrams (10)	
- knowledge of materials, manufacturing processes, and mechanical components covered in class (3)	
3. Investigation	2
- understanding of system and materials from observation and simple tests, application of methods learned in class (2)	
4. Design	4
- understanding of the purpose of the system and its components: functions of parts, choices of materials and manufacturing methods, possible design improvements (3)	
- explanatory sketches and photos with parts labelled (1)	
7. Communication	5
- grammar and spelling (2)	
- clarity of explanations and logic (1)	
- presentation: organization, quality of images, neatness of sketches (1)	
- correct use of references for information from other sources (1)	
Total	24

Students who do not complete the report requirement will receive a mark of EIN (incomplete) for the course.

9. Plagiarism

Any material in your report taken from other sources, whether quotations, figures, or special information, must be so marked and given a reference at the end. Text taken directly from another source must be in quotation marks (“ ”); longer quotations should be indented from the main text instead. Note that the reference must appear at the point in the text at which the quotation is used or in the caption of the figure which is reproduced from another source. It is not enough to list the sources at the end of the report. **If you do not do these things, you are committing plagiarism, and you will be subject to sanctions for academic fraud, as detailed in the University regulations on academic fraud** (p. 22 of the Faculty’s Academic Regulations, available on the web at

www.genie.uottawa.ca/undergraduate/current/regeng.php.)

See also the University’s regulations:

<http://web5.uottawa.ca/mcs-smc/academicintegrity/regulation.php>

More details on avoiding plagiarism are given at

<http://www.sass.uottawa.ca/writing/kit/plagiarism.pdf>