WKRPT 200/300/400: Work Term Report Course Outline

Department of Chemical Engineering
University of Waterloo

Please note: this outline applies only to students enrolled in the Chemical Engineering program

1. Course Administrative Information

Course outline effective date: Spring 2016

Course coordinator: Dr Jason Grove, Lecturer, E6-4008, e-mail: jagrove@uwaterloo.ca

Changes to the course outline: these will be communicated via e-mail/updates on the departmental Webpage at:
https://uwaterloo.ca/chemical-engineering/current-undergraduate-students/work-report-guidelines

2. Work Report Requirements

Terms in which a report must be submitted: as described in the calendar (see “Rules” under “Examinations and promotions”), you are required to submit a total of three work reports in the following terms:

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<th>Report</th>
<th>Stream 4</th>
<th>Stream 8</th>
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<tbody>
<tr>
<td>WKRPT 200</td>
<td>2B</td>
<td>3A</td>
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<tr>
<td>WKRPT 300</td>
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<td>WKRPT 400</td>
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Stream switching: If you are no longer with your original cohort for any reason, note that reports are due based on the academic stream that you are currently in. If this may result in your missing a work report, please contact the undergraduate coordinator for advice.

3. Report Submission

Submission format: You must submit a securely bound hardcopy. There is a page limit of 25 pages for the main body of the report (see further guidelines below). Double-sided printing is acceptable.

Submission deadline: Work-term reports are due seven days after the first official day of lectures of the academic term in which the report is required. Submit a securely bound hardcopy to the main chemical engineering office in E6 (3rd floor, room E6-3024) by 4:30 pm.
Late submission: Reports submitted after the deadline will receive grades of Unacceptable (38) and will be carried forward to the following academic term for evaluation; these reports not eligible for prizes.

Resubmission deadline: If a resubmission is required, the deadline for the revised report is 4:30 pm on the last day of lectures, otherwise a grade of Unacceptable (38) will be assigned. The original report and grading form must be included with the re-submission.

4. Grading

Work reports must be graded by either regular or adjunct faculty members in the department. Note that the department does not permit employer-marked reports.

Grading is based on the appended marking rubric. The following grades may be assigned, where a grade of “Satisfactory” or better represents a passing grade:

- Outstanding: 95%
- Excellent: 89%
- Good: 75%
- Satisfactory: 65%
- Unsatisfactory: 38%

Resubmit

A resubmit will be assigned if the grader considers that deficiencies in the report prevent the assignment of a passing grade; a resubmit will be required automatically if the report is unsatisfactory in certain categories, as indicated on the marking rubric. If the resubmitted report is worthy of a passing grade then usually a grade of Satisfactory (65%) will be awarded.

A grade of unsatisfactory represents a failed course. This grade will be assigned if:

- You do not submit a work report by the deadline;
- You are required to revise and resubmit your report and do not do so by the resubmission deadline;
- or,
- The report (either original or revised) is deemed unacceptable by the reviewer; while an opportunity for resubmission will usually be offered, a grade of unsatisfactory may be assigned for very serious deficiencies in the original submission.

Consequences of an “unsatisfactory” grade: This counts as a failed course and contributes to your accumulated failure count for promotion decisions.

Clearing a failure: Failed work-term reports are cleared by re-taking the WKRPT course (i.e., submitting a new report) and passing it in a subsequent term.
5. Prizes
Prizes are awarded each term for the best work report at each level (200/300/400). The winner is selected by the work report coordinator out of the reports graded “outstanding”. Consideration for prizes is automatic and there is no need to enter.

Work reports that are confidential, resubmitted, or submitted to clear a previous failure are not eligible for prizes.

6. Individual Work Expectations
The work term report is an individual assignment and you are expected to write your own report based on your own analysis. It is recognized that many reports may be based on activities performed, in whole or in part, together with colleagues in the workplace; this is acceptable but the contribution of others should be clearly indicated in both the report and the letter of submittal.

7. Work Report Content Guidelines

7.1. Report Objectives
The purpose of writing work-term reports is so that you can develop and demonstrate:

- Competence in communicating technical information and data in written form,
- The ability to select and apply appropriate means of analysis to data and other technical information, and,
- The ability to draw reasoned conclusions and make associated recommendations based on interpretation of the analysis.

7.2. Suitable Content
Reports may be written on a wide variety of subjects provided that suitable technical content is included. Ideally, you should try to identify something related to your job responsibilities; however, this is not always possible. It is expected that the level and quality of technical analysis, as well as your communication skills, will increase as you progress through your studies. Note that technical analysis may also include qualitative aspects and/or rely on engineering judgement.

Representative examples of suitable subject areas include:

- Experimental studies (including designing and performing experiments, data analysis, and conclusions);
- Detailed design of process equipment (e.g., reactor sizing, safety valve sizing);
- Analysis of aspects of business operations (e.g., analysis of the impacts of downtime or maintenance scheduling);
• Root-cause analysis (e.g., identifying the underlying problem causing some process mishap);
• Safety or environment analyses (e.g., HAZOP, lifecycle analysis);
• Etc.

If you are unsure that your topic will be suitable, you are encouraged to contact the department for advice (see above).

7.3. Analytical Content

The report must contain technical analysis at an appropriate level (based on your term of study). Please note that analysis in this context is not limited to the statistical analysis of data. Analysis refers to the objective and detailed examination of something and an appropriate method depends on what is being analyzed.

7.4. Report Structure

It is important that the report is properly structured as a technical document. The typical sections of a good report are described below; your report may deviate from this structure or headings. Note that this is a technical report and not a lab report. Pay particular attention to the descriptions of each section, since these highlight many common problems encountered in work-term reports.

Page limit: the main body (including all pages from introduction to references) of the report should be no longer than 25 pages in length (using a font size and page layout, including line spacing and margins etc., that would be acceptable if the report were submitted in the workplace). If your report exceeds this length, consider what material can be removed, reformatted, or would be better placed in an appendix.

Title Page

The report should include a title page including (in order), University of Waterloo, Faculty of Engineering, the title of the report, the name and location of your employer, your name, student ID number, program (i.e., Chemical Engineering) and the date of report preparation.

Letter of Submission

Include a formal letter of submission with your report as the first page inside the front cover. This page should not be numbered. The letter should be addressed to the Chair of the chemical engineering department and should be signed by you at the bottom. The body of the letter should include:

• The title of the report as well as its number (i.e., first, second or third report)
• Your previous academic term
• Your employer, including company name, division/department/etc., location and supervisor
• A brief description of the employer’s activities as relevant to your employment
The purpose of the report

Acknowledgement of the source and explanation of any assistance received with the report; the letter must include the following statement: "This report was written entirely by me* and has not received any previous academic credit at this or any other institution". *If this statement is not true, you must modify it and explain specifically what was and was not written by you.

A statement identifying whether the material is confidential, if required.

Executive Summary

This is a self-contained summary of your work and should be approximately one page in length. It should state: i) what you did, ii) why you did it, iii) what you found (conclusions), and, iv) what you recommend as a result of your findings. In business the executive summary is the most important part of any document, since this is the only part more senior people will read.

Note that it is not a teaser to make the reader interested in the main report. It should describe the work done, conclusions, and recommendations; it should not describe what can be found in the report (for example, do not write “conclusions and recommendations are made based on the experimental findings” but do write “the experimental results showed a 12% reduction in energy consumption” or “it is recommended that a full-scale trial be performed using the new formulation”).

Do not simply copy and paste the conclusions and recommendations from the main body of the report. The summary should be a thoughtful description of the most important aspects of your work. Therefore, you may choose to highlight most important findings and possibly omit more minor ones.

Write the page number of the summary in Roman numerals. Although the title page and letter do not have numbers printed on them, you should still count them (so the summary will usually be page iii).

Table of Contents and Lists of Tables and Figures

Add a table of contents. Use your judgement to determine the appropriate number of subheadings to list. Include lists of tables and figures in the report; in these, include only the main title and not the entire caption if it includes additional information. Number these pages with Roman numerals.

1. Introduction

Provide the reader with a brief introduction (1 to 2 pages) to your work. At the end of the introduction, the reader should have a good idea of what are set out to do and your motivation for doing it. This is an introduction to your specific work and not to the general area. At the end of the introduction, the reader should have a clear idea of what the report is about.
2. Literature Review/Background Information

Provide sufficient background and theory to allow your analysis to be understood. Tailor the literature review to the work you are doing. For example, if your study concerns a proton exchange membrane fuel cell (PEMFC), you may wish to mention that other types of fuel cell exist and perhaps briefly explain why you are focused on this type, but there is no need for a detailed description of every type of fuel cell. The information presented should be relevant to the report and should not be general knowledge; I am aware that hydrocarbon deposits originate from prehistoric organic matter and do not need a description of this.

It is expected that care will be demonstrated with respect to academic integrity throughout the report; in particular, appropriate paraphrasing and proper citation of published works is required. Excellent literature review resources are available through the UW Library’s subject guide, at http://subjectguides.uwaterloo.ca/chemeng.

3. Method and Materials

Describe what you did and what materials you used. Be precise and complete but also as concise as possible. Relegate long, tedious information (e.g., software screenshots, lists of experimental apparatus) to an appendix. If you have done an experimental study, look in a scientific paper to get a feel for the usual style. Do not include long descriptions or images of obvious techniques or equipment – we all know what a glass beaker looks like without seeing a photograph.

Be precise in your descriptions. If you rely on data from the plant, describe exactly where it came from – somebody might want to check on your project in two years and they want to be able to find the same data for comparison. If you get information from a particular person, include their title and department as well as their name: “Bob” might resign, get fired, get promoted, retire or transfer to the Timbuctoo plant, but if this happens to “Sally the Production Line Operator” then your successor can find Sally’s successor.

4. Results and Discussion

Describe what you found. Results are the objective outcome of your experiment; these are factual statements of your data and findings. Discussion is your interpretation of these results in the context of your work and that of others. These sections are sometimes presented as separate “Results” and “Discussion” sections and you can do this if it is appropriate.

Remember that your job is to present this information to the reader and guide the reader through your interpretation. So, make use of figures and tables but think carefully about what is in these and how they are presented. Make sure you refer to every figure and table somewhere in the text. Remember that you have taken one or more courses on statistics – if you have data, you may want to make use of your knowledge and skills in this area.

5. Conclusions

What can you conclude from your work? Conclusions are established based directly on your results and discussions. They can be based on quantitative or qualitative analysis. Conclusions are often very specific; do not feel that you need to make wide-ranging generalizations – it is
unlikely that you can reach profound conclusions in a report describing perhaps one project out of a number accomplished on a work term. For the same reasons, do not expect to have a large number of conclusions based on a short study. In other words, be realistic about your work: take pride in it but do not overstate its significance. For example, if your work has been based on adhesive formulation, perhaps you have improved the performance of a particular adhesive for a certain application, but it is unlikely that you can apply this result to all adhesives in general or conclude that all steel fabricators should abandon welding and start using your product.

6. Recommendations
Describe the recommendations you can make based directly on your analysis and conclusions as presented in the report. Do not make very broad recommendations that are not justified by the analysis and conclusions. Note that recommendations may also be negative (e.g., do not proceed further with this project in its current form). In general, recommendations may be to implement something (e.g., do a full-scale trial of your new formulation), to do more work in the area (try and specify what could be considered), to apply the approach to other areas (again, specify if possible), etc.

7. List of References
List the references that you have used in preparing the report. Note that you must provide a list of references (where each reference is specifically cited in the text), as distinct from a bibliography (where you do not make specific citations in the text). See further information below.

Appendices
Place information that is not essential to the report in an organized set of appendices (in general, assume that appendices will not be read, but you are providing the information in case a particularly detailed review or check of your work is required). Suitable information for appendices would include tables of raw data, detailed technical information, sample calculations, MSDS, step-by-step experimental procedures, etc. Each appendix must be explicitly referred to as appropriate—and at least once—in the main body of the report (e.g., “a HAZOP was performed using the company’s standard list of guidewords (provided in Appendix E),” or “raw data are provided in Appendix C and sample calculations in Appendix D”).

7.5. References
The purpose of a reference is to provide weight to statements that you have made and to acknowledge the work of others (this is good professional practice, as well as common courtesy). Good references should therefore be authoritative and objective; they should also be current (note, although this frequently implies they should be recent, this is not necessarily the case). The majority of your references should be primary sources (e.g., original research papers). Secondary sources (e.g., published review articles) are extremely useful resources in research and can be cited where they contain analysis, evaluation, interpretation, etc., but you should go back and check the cited primary sources for other information you wish to rely on; however, note that it is usually acceptable to cite documents written to
support engineering practice (including company and other handbooks, manuals, textbooks, etc.) but you should be aware that these books do have errors in them—if the information is really critical to your work you are well advised to check back to the primary source. Tertiary sources are similar to secondary sources but typically provide a general overview of a subject (for example, encyclopedias); these can be very useful in beginning the process of research but are generally unsuitable as references.

**How to Reference**

You should place a reference anywhere that you have used facts, data, opinions, etc., from an external source. Typical references include published works (books, journals, etc.), company documents (handbooks, reports, etc.), Websites, patents, standards, etc. If you are relying on a conversation or other correspondence with an individual, this can be referenced as a “personal communication”. Note that this is citation-style referencing: a stated fact or opinion is followed by a specific citation, which are all listed together in the “List of References” section. This is distinct from a bibliography (where you list relevant publications but do not make specific citations in the text). Bibliographies are generally unsuitable for engineering reports.

Please note that you should paraphrase the material you reference. It is not acceptable to reproduce verbatim from the cited works. In exceptional cases you may wish to quote from another author (if the specific words used are for some reason important or particularly powerful), in which case you should clearly indicate this via quotation marks or italics.

**Wikipedia**

Do not cite Wikipedia because: i) it is a tertiary source, and, ii) authorship is anonymous and the review process opaque; therefore, the authority and objectivity of the information cannot be established. In case you are unconvinced, even Wikipedia\(^1\)\(^2\) agrees.

**Reproduction of Images**

The exact reproduction of an image (without redrawing) from another source is acceptable, but the need for acknowledgement goes beyond a simple citation; in this case, you have actually taken someone else’s work and are presenting it in your report. In this case, write something like: Reproduced from <<author, year>>. Copyright <<holder>>, <<year>>. Do not write “reproduced with permission” unless you have actually sought and received permission. Note that the copyright holder is generally the publisher and not the author (there are exceptions, for example, authors of Master’s and PhD theses retain copyright to their work). Note, if you have re-drawn the figure or typed the data into your own table, then just cite in the usual way.

The UW library maintains a page about reproducing copyrighted works, see: [http://www.lib.uwaterloo.ca/copyright/](http://www.lib.uwaterloo.ca/copyright/)

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\(^2\) In this special case, I consider citing Wikipedia to be acceptable!
Citation Style

You have two basic choices for reference styles, either number each reference sequentially as it appears in the report or use an (author, year) style. For the list of references, adopt a clear and consistent format; you may be familiar with the IEEE format from first-year courses, or with the APA format. These are briefly summarized below, but for further guidance you are advised to consult the library’s webpage at: https://uwaterloo.ca/library/find-and-use-resources/citing-sources

Numbered Citation Styles

Number the citations in the order they appear in the document. In the main text, these should appear in a consistent style; typically, this is in square parentheses either in-line with the regular text [12] or superscripted.[12] Multiple references are separated by a comma for two references [12,13] or an en-dash for a sequence.[12–14] For an en-dash, most word processors will convert two dashes “—” into one or sometimes use the key sequence <ctrl> + number pad “–”. The list of references should be in the same sequence as in the text, formatted in a consistent style:

(Author, Year) Citation Styles

Write the last names of the authors and the date of publication in round parentheses. List one or two names only (Grove, 2013) or (Grove and Smith, 2013); if the publication has three or more authors use et al. (abbreviated Latin et alia, and others) (Grove et al., 2013). If you have stated the name of the author, then include only the date in brackets; for example, according to Grove et al. (2013), …

If you are citing multiple papers from the same author(s) and year, you can distinguish these by adding letters after the year. For example, (Grove, 2013a) and (Grove, 2013b)

In this case, the list of references should be in alphabetical order by last name (note in the list of references, include all author names and do not use et al.).

Information to Include in a Reference

The reference you provide the reader with a “map” to enable them to find the document you are citing. The information included should show always show both authorship (for webpages, this may be the company) and a date (for webpages, you may only be able to provide the date accessed) and should be as precise as possible. The same rules apply if you are referencing internal company documents: the objective is to allow someone else to track down the document that you are citing. See the library’s guide (link provided above) for standard ways to do this in different citation styles.
8. Style and Format

The objective of writing is communication. Good writing will ensure that the reader not only understands what the writer intended but also is confident that they have got the message. Consider the New York plumber who excitedly contacted the National Bureau of Standards about their discovery that hydrochloric acid could clear clogged drains:

“The efficacy of hydrochloric acid is indisputable” the Bureau wrote back, “but the ionic residues are incompatible with metallic permanence.”

“Thank you,” replied the plumber, “I thought it was a good idea too.”

Finally someone at the Bureau wrote, “Don’t use hydrochloric acid! It eats hell out of the pipes!”

8.1. Style

The work term report should be prepared as a formal technical report suitable for a business environment. You should aim to write in a clear, concise style and to communicate comprehensibly and unambiguously. Some tips:

- In terms of background knowledge base, assume the reader is another student in your class; thus, expect them to have general knowledge of chemical engineering but to lack specific knowledge of the report.

- Be precise and concise wherever possible. For example, do not write “some”: how many were there?

- Avoid exaggerated or unfounded claims and unstated assumptions.

- Prefer the active voice to the passive.

- Use the first person (I, we) where appropriate to improve readability.

- Use formal language. For example, write “does not” rather than “doesn’t”.

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3 There is some debate about whether they is acceptable as a gender-neutral pronoun in preference to he/she or other contortions. Since they is now prevalent in spoken English and was okay for Chaucer in 1395 (the Pardoner’s Tale), Shakespeare in 1594 (the Comedy of Errors, among others), Austen in 1813 (75 times in Pride and Prejudice), and the Washington Post in 2016 (Style Guide), it should also be okay in your technical report.

8.2. Structure

**Binding:** the report should be securely bound with a clear front cover.

**Cover page:** full page including course number and name, title of report, student name and identification number. Count this as page i but do not write the page number. **Confidential reports should clearly indicate this on the cover page.**

**Submittal letter:** formal letter of submittal addressed to the chair of the department describing the report. Must contain a statement that the work is the student’s own and identifying any help received. Sign the letter and below write your name and identification number. Indicate page numbers at the bottom of all pages beginning here.

**Front Matter (pages numbered with Roman numerals; no section numbers)**

**Summary:** this is a complete summary of your report in about one page (continue to a second page if necessary, but certainly not a third for a report of this length). While it may be beneficial to make use of bulleted lists, most of the summary should be written in regular prose.

**Table of contents:** Include section title but no section number.

**Lists of tables and figures:** Include title(s) but no section number.

**Nomenclature:** Optional. Include if the report is very heavy on mathematical variables and you judge a nomenclature would be of use to the reader. Likewise, include a list of acronyms if appropriate.

**Main Body (pages numbered with Arabic numerals; include section numbers)**

1.0 **Introduction:** use section numbers and a distinct heading style

1.1 Sub-section: number sub-sections, use the same font as the main heading but vary size and emphasis (bold, etc.)

Paragraphs should be in a consistent and easy-to-read font; this can be different to the section heading font. Make use of indents and paragraph spacing to make the report easy to read. Divide the content into logical sub-sections with numbers (1.1, 1.2); number subsections down to at most level three (e.g., 1.3.2).

2.0 **Section Name**

y.0 **List of References**

You must include a list of references, where each reference is clearly cited in the text. Note that a bibliography, which provides a general list of references but does not provide specific citations in the text, is not acceptable. Citations in the text should either follow the (author, year) format or be numbered in order of appearance in square parentheses.
Back Matter (pages numbered with Arabic numerals, continued from front matter)

Appendix A: Provide appendices as appropriate. Each appendix must be clearly cited in the main text.

8.3. Format

Use a format (font size, line spacing, margins, etc.) that is professional in appearance. Include page and section numbers.

Tables and figures should be numbered sequentially as they appear in the text (Table 1, Table 2; Figure 1, Figure 2, ...); numbering can be reset in each section if the section number is also included (Table 2.1, etc.). Each table and figure must be referred to in the main body of the report. Provide a caption for each table (above the table) and figure (below). The caption should indicate the table or figure number and describe the contents. The caption is a sentence and should be formatted as such. Tables usually look better without any vertical lines and with few horizontal ones.

Note that underlining was for typewriters; if you are writing on a new-fangled personal microcomputer, try bold or italic instead (these were not available on mechanical typewriters). The only exception is for hyperlinks.

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5 If you disagree with this, try and find underlining used for emphasis in a textbook. Or in any book, newspaper or magazine (excluding advertisements for car dealerships and discount furniture stores).
9. University Policies

**Academic integrity**: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity for more information.]

**Grievance**: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

**Discipline**: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

**Appeals**: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

**Note for students with disabilities**: AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.