

GENERAL REPORT WRITING GUIDELINES & PRESENTATION TIPS FOR IEGR 496/498 - SENIOR DESIGN I/II

Department of Industrial & Systems Engineering

Morgan State University

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Purpose

IEGR 496: SENIOR DESIGN I - 1 credit. This is a capstone design course emphasizing analysis and design in a specific industrial engineering problem area under the guidance of a faculty advisor. Students are expected to devote at least six unscheduled hours for each scheduled credit hour for this course. During this phase the student or student team is to identify the problem and analyze optional solutions and submit a written proposal describing how the project is to be executed during the follow-on course IEGR 498.

IEGR 498: SENIOR DESIGN II - 2 credits. This course is a follow-up execution of the project proposed in course IEGR 496. Students are expected to devote at least six unscheduled hours for each scheduled credit hour for this course. A final written report is required of the students. If a team of students executed the project, each student is required to submit a report describing the special aspects of the project executed by the student. An oral presentation of the project and its results is also required. The report should contain a summary of data and analysis that led to the design recommendation. Students are also required to pass an IE comprehensive examination.

Prerequisites: IEGR 496, and project Advisor's Consent and Department Chair's Approval.

General Format

The report should be word processed, single-spaced and fully justified (Ctrl+J) on standard-sized paper (8.5" x 11"). There must be a 1" margins on all sides (i.e. where the top, bottom, right and left sides are even) of the submitted paper. Font size for the text should be 12 point and the font type should be Times New Roman throughout the report unless otherwise specified below. The front matter of the report should contain a title page, a Table of Contents, a List of Tables, and a List of Figures as indicated and described in detail below. The body of the research report should contain the following headings: Abstract, Keywords, Introduction, Literature Review, Methodology, Data Analysis, Results and Discussion, Conclusion and Recommendation, Timeline, and References. The back matter can include an Appendix section. These headings should be in bold-type 12-pt font and aligned to the left margin of the paper. **Never** start a heading at the bottom of any page as a single line item. Simply make a page break, and start the heading at the top of the next page. Double-space between titles, headings and paragraphs as well as between body text and headings. The research and project is to be completed first, followed by the completion of the written paper and concluded with an oral presentation describing the content and context of the project and paper. Generally, the proposal report (for IEGR 496) or the final paper (for IEGR 498) should be submitted **two weeks prior** to the presentation date.

TITLE PAGE

The report must contain a title page which should be formatting as indicated below. The title of the report should be in 14-pt bold type font and centered. The student's name should appear directly below the title (not in bold, but in 12-pt font). All additional items should be in 12-pt font. The advisor's name should appear below the student's name (12-pt font) followed by the institutional name (Morgan State University), Department name (Industrial & Systems Engineering) and the semester of presentation (Fall-2017). A sample title page is in the Appendix.

TABLE OF CONTENTS

There should be a table of contents which outlines the main topic areas that are included in your report. The table of contents should be generated automatically from within Microsoft Word (or any other appropriate word processor tools that may be appropriate for use) at the completion of the finished document. This will allow proper format for each individual project. This tool is available under the 'References' tab.

LIST OF FIGURES

There should be a list of figures which outlines the figures that are included in your report. The list of figures should be generated automatically from within Microsoft Word (or any other appropriate word processor tools that may be appropriate for use) at the completion of the finished document. This will allow proper format for each individual project. This tool is available under the 'References' tab.

LIST OF TABLES

There should be a list of tables which outlines the tables that are included in your report. The list of tables should be generated automatically from within Microsoft Word (or any other appropriate word processor tools that may be appropriate for use) at the completion of the finished document. This will allow proper format for each individual project. This tool is available under the 'References' tab.

ABSTRACT

Each report must contain an abstract section. The word 'Abstract' should be aligned to the left margin in bold with 12-pt font. Double-space and begin the text on the next line with no indentation. The abstract should be a single-spaced concise summary of the key points of your research. It should contain a brief introduction of the research topic, a summary of the methods, results, data analysis, and conclusions. Include possible implications of your research and future

work that may be addressed with your findings. The abstract section should consist of 1-2 paragraphs.

KEYWORDS

A line called Keywords should be placed below the abstract section of the report. Double-space and type the Keywords: in bold with 12-pt font. Include 3-6 words/phrases that are significant to the project.

INTRODUCTION

This section should introduce your topic. The introduction discusses the importance of the topic, the problem focus of the topic, the interest of the topic and the relevance of the topic. The main objectives of the research project should be included in the last paragraph of the introduction.

LITERATURE REVIEW

The literature review section discusses current research that is relevant to the project. There is always research relevant to all Industrial engineering topics that have been conducted and/or are currently being conducted. Thus, there must be a minimum of **five to six** peer-reviewed refereed journal articles to be included for review within the literature review section **and** a minimum of **five to six** other references/resources (e.g., web articles, magazine articles, books, etc.) to be summarized within the literature review section as well as utilized within the project report. In general, each reference should contain a 2-3 paragraph summary explaining the research and its significance as relevant to the senior design report. Proper APA formatted in-text citations must be utilized (Author, year) throughout this section as well as throughout the entire report. Many examples of how to write these properly can be found at the Purdue OWL website using the following link: <https://owl.english.purdue.edu/owl/resource/560/03/>

METHODOLOGY

The methodology section should explain the actual ‘problem area’ of the project. Be sure to state the problem, its relevance to engineering and society, ways the problem have been addressed previously and how the problem was addressed currently in the project. In addition, this section should include minimally the following: participants (be sure to include IRB forms if necessary); tools/devices/equipment/models utilized; experimental protocols; step-by-step procedures for data collections; and statistical principles used in data analysis. For IEGR 496 reports, this section would be entitled ‘**Proposed Methodology**’ since the actual work would not have taken place yet and it should discuss the methodology that is proposed to be carried out.

DATA ANALYSIS

This section should demonstrate an understanding of the data and results collected in the project. There should be some solutions, productivity tables, engineering economic analysis, etc. based on coursework that was taught in the Industrial engineering department. In addition, the data analysis sections must contain: (1) Descriptive statistics: summary of the data collected (mean, standard deviation, median, range, etc.) and (2) Inferential statistics: any inference made using hypothesis testing, or any other methods. For IEGR 496, this section should be entitled '**Preliminary Data Analysis**' and it should discuss any data collection and preliminary work that has been performed up to the date of the 496 proposal presentation.

RESULTS AND DISCUSSION

This section should include both preliminary and final results of the project. There should be explanations of the results found. In addition, a comparative explanation is to be included which describes the results of the current project with the results of previous research in the literature. It should also explain if the results obtained are in conformance with the results of similar studies done in the past. For IEGR 496, this section should not be present in the report or presentation since no work has been completed yet.

CONCLUSION AND RECOMMENDATION/S

This section should be closely related to the objective/s of the study. It should explain whether the objective/s was/were achieved or not. If not, what could be the possible reasons for it? Furthermore, there should be explanations of what statistical significance the results of the project concluded and if the results are significant to the objective/s of the research. If there are any recommendations for future research as a continuation of this study they should be presented here. For IEGR 496, the section should be entitled '**Proposed Deliverables**' and it must state what product, process(es), procedure(s), algorithms, etc. will be delivered to the ISE department at the conclusion of the work.

TIMELINE

This mandatory section (for 496 & 498) should include a page which shows the timeline of your project events in the form of a Gantt chart. For samples, ask your senior design project advisor.

REFERENCES

All references used in the project should be included in the reference section of the project. In general the project should include 5-6 refereed journal reference sources **and** 5-6 additional reference sources. The format for the reference section is APA-style which is described in great detail at the Purdue OWL website at <https://owl.english.purdue.edu/owl/resource/560/06/>. Simply click the appropriate 'Reference List' link on the left column for the proper source that

you need to utilize at. For additional referencing help refer to the APA Style FAQ webpage located at <http://www.apastyle.org/learn/faqs/index.aspx> or the 'Basic of APA Style Tutorial' webpage located at <http://www.apastyle.org/learn/tutorials/basics-tutorial.aspx> . When you click 'VIEW THE TUTORIAL', a slideshow should begin. Simply follow the instructions. If it does not work, then you may need to update the Adobe Flash Player version for your browser first before viewing the tutorial.

APPENDIX

Any additional items that you want to include that would not normally go in the main report could be placed here (e.g., more CAD drawings, programming code, more calculations, etc.).

ADDITIONAL INFORMATION

Grammar

Proper English grammar, spelling, punctuation, capitalization and formatting is expected to be used throughout the entire project paper. These items are just as important as the technical aspects of the paper. In order to assist with the technicalities of some grammar items, the following subtopics have been included.

Use of Abbreviations

Abbreviations should be limited to instances when a) the abbreviation is standard and will not interfere with the reader's understanding and b) if space and repetition can be greatly avoided through abbreviation.

When abbreviating a term, use the full term the first time you use it, followed immediately by the abbreviation in parentheses. Standard abbreviations like units of measurement and states do not need to be written out. Also, abbreviations that appear as words in *Meriam-Webster's Collegiate Dictionary* are acceptable without explanation (IQ, REM, AIDS, HIV). Do not abbreviate: day, week, month, year. Do abbreviate: hr, min, ms, ns, s. To form the plural of abbreviations, add 's' alone without apostrophe or italicization (i.e. vols., IQs, Eds.). Do not add s to pluralize units of measurement (12 m not 12 ms).

Do not use periods or spaces in abbreviations of all capital letters, unless it is a proper name *or* refers to participants using identity-concealing labels: (i.e. MA, CD, HTML, APA). Also, do not use periods when abbreviating measurements (i.e. cd, ft, lb, mi, min), except when abbreviating inches (i.e. in.) to avoid confusion.

Some exceptions include when abbreviating the United States as an adjective (i.e. U.S. Marines) Also, use a period if the abbreviation is a Latin abbreviation or a reference abbreviation (i.e., etc., e.g., a.m. *or* Vol. 7, p. 12, 4th ed.). Units of measurement and statistical abbreviations should only be abbreviated when accompanied by numerical values (i.e., 7 mg, 12 mi, $M = 7.5$ measured in milligrams).

Equations

Equations used within the project should be properly formatted such that formulas are written at the left margin with the corresponding equation number written to the far right side of the page in parentheses. This is demonstrated below.

$$y = mx + b \quad (2-1)$$

Each equation should be explained within the text of the project. The variables involved in the equation must be explained such that the reader can have an understanding of the equation. For example, a description that could be written could be the following:

Equation 2-1 describes the slope of a line where m represents the slope, x represents the x data variable, and b represents the y - intercept.

The very next (i.e., second) equation in this same section would have the equation number (2-2) and so forth. If equations follow in subsequent sections of the report, simply use the same numbering format for that section, but restart the equation number. For example, if an equation is necessary in section 3 of the report, it should be numbered as (3-1) to indicate section 3, equation 1. The next would be (3-2) and so forth.

Tables and Figures

The purpose of tables and figures in documents is to enhance the reader's understanding of the information in the document. Most word processing software available today will allow you to create tables and figures, and even the most basic of word processors permit the embedding of images, enabling the inclusion of tables and figures in almost any document.

General guidelines

Tables and figures supplement the text. Thus, refer in the text to all tables and figures used and explain what the reader should look for when using the table or figure. Each table and figure must include an explanation inclusive of every abbreviation used (except the standard statistical symbols and abbreviations)

All tables should be numbered in sequential order and refer to in the text (Table 1, Table 2, etc.), likewise for figures (Figure 1, Figure 2, etc.). Abbreviations, terminology, probability level values must be consistent across tables and figures. Likewise, formats, titles, and headings must be consistent. Do not repeat the same data in different tables. If the report includes an Appendix with tables, identify them with capital letters and Arabic numerals (e.g. Table A1, Table B2).

Keep headings clear and brief. The heading should not be much wider than the widest entry in the column. Use of standard abbreviations can aid in achieving that goal. All columns must have headings.

In reporting the data, consistency is key. Numerals should be expressed to a consistent number of decimal places that is determined by the precision of measurement. Never change the unit of measurement or the number of decimal places in the same column.

Captions and Legends

For tables, be sure to use a table number (i.e., *Table X*) for each data table shown in the project. In addition, captions should always be placed **above** the table in the project.

For figures, make sure to include the figure number and a title with a legend and caption. These elements appear **below** the visual display. For the figure number, type *Figure X*. Then type the title of the figure in upper and lowercase letters. Follow the title with a legend that explains the symbols in the figure and a caption that explains the figure.

Graphs should always include a legend that explains the symbols, abbreviations, and terminology used in the figure. These terms must be consistent with those used in the text and in other figures. The lettering in the figure should be of the same type and size as that used in the figure. Lastly, graphs **must** include a title and both axes **must** be fully labeled with an appropriate description of the data. For example, if in a given project one measured the amount of rainfall over a 7-day period for two different weeks, one could have captured the data and created the following graph as shown in Figure 1. Note that there is a chart title, and two axis titles, as well as, a legend which shows the two trials.

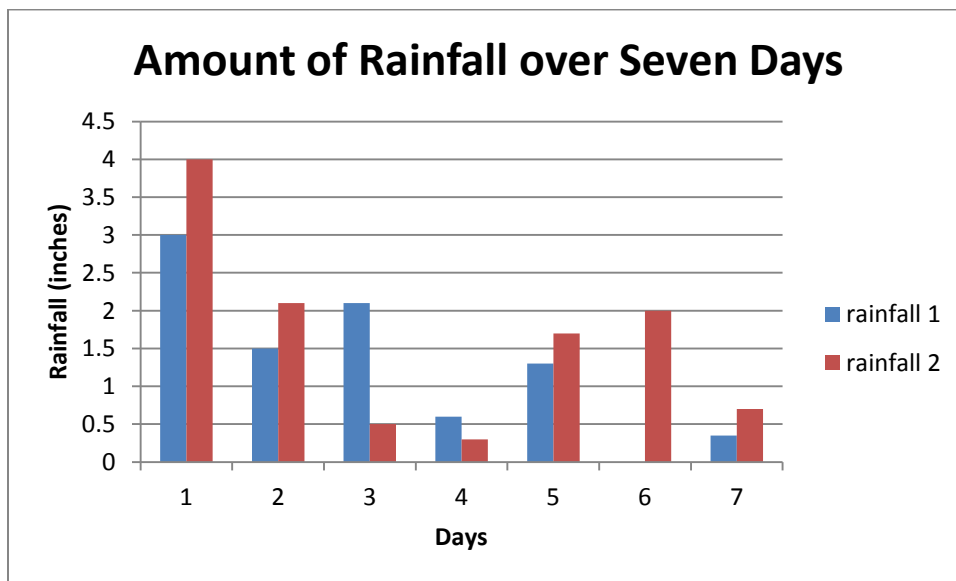


Figure 1. Two trials of rainfall collected over seven days.

Preparing Figures

In preparing figures, communication and readability must be the ultimate criteria. Avoid the temptation to use the special effects available in most advanced software packages. Avoid use of three-dimensional effects, shading, and layered text.

The APA has determined specifications for the size of figures and the fonts used in them. Figures of one column must be between 2 and 3.25 inches wide (5 to 8.45 cm). Two-column figures must be between 4.25 and 6.875 inches wide (10.6 to 17.5 cm). The height of figures should not exceed the top and bottom margins. The text in a figure should be in a san serif font (such as Helvetica, Ariel, or Futura). The font size must be between eight and fourteen point. Use circles and squares to distinguish curves on a line graph (at the same font size as the other labels).

Types of Figures

Graphs are good at quickly conveying relationships like comparison and distribution. The most common forms of graphs are ***scatter plots, line graphs, bar graphs, pictorial graphs, and pie graphs***. Spreadsheet programs such as Microsoft Excel can generate these types of graphs.

Charts are used to represent the components of larger objects or groups (e. g. a tribal hierarchy), the steps in a process (as in a flow-chart), or the schematics of an object (the components of a cell phone).

Drawings and Photographs are used to convey information to the reader. For readability and simplicity, line drawings should be used, and photographs should have the highest possible contrast between the background and focal point. Convert color photographs to black and white before printing on a laser printer. For any items that are not of your own creation, you must reference these properly to give the original author credit.

SOURCES

Purdue Online Writing Laboratory (OWL) at Purdue University and APA Style websites. Revisions/Modifications by Richard Pitts, Jr., PhD, Morgan State University (2017), and Bheem Kattel, PhD, Morgan State University (2017).

Appendix

Sample of Title Page (this is **not** a header)

IEGR 498: Senior Design Project II

**The Improvement of Senior Design Projects for Industrial Engineering
Students**

John Doe

Advisor: Dr. Smith

Department of Industrial and Systems Engineering

Morgan State University

(Spring 2017)

Sample Approval Sheet (this is **not** a header)

IEGR 498

Senior Design Project II

(Semester Year)

Department of Industrial and Systems Engineering

Morgan State University

(Project Title)

By

(Your Name)

A Report submitted to the Department of Industrial and Systems Engineering in partial fulfillment of the requirements for Bachelor of Science Degree in Industrial Engineering *

Approved by:

Faculty Advisor _____

(Name)

Date _____

Department Chairperson _____

(Name)

Date _____

Presentation Tips for IEGR 496 and IEGR 498

General

- **ALWAYS HAVE A BACKUP PLAN!!** We do everything in our power to make sure that problems do not arise, but sometimes things go wrong. Try to have an "alternate no AV" lecture planned, if the system should go down.
- **Check out the room ahead of time.** Before your presentation, check out the room, and make sure it has everything you need. This will avoid unwanted surprises the first day of class.
- **Practice.** If you have a complex presentation planned with several different multimedia, go to the room ahead of time and practice your presentation. We would be happy to meet you at the room and assist with any preparations or extra instructions.
- **Experiment and try new things.** These rooms often have capabilities other than what most people use them for. Something as simple as playing a CD while students enter and exit often adds to the class. We would be happy to assist you in experimenting.
- **Invest in a laser pointer.** They are inexpensive and are extremely useful.
- **Use color to influence mood and emotion.** The colors for type, illustrations and backgrounds influence the way they are perceived. Here is a basic guide to using color in your presentations:

Red – excitement, alert
Green – growth
Yellow – confidence, warmth, wisdom
Purple – dignity, sophistication
White – professionalism, new, innocence
Blue – truth, trust, justice
Black – authority, strength
Orange – action, optimism
Brown – friendliness, warmth
Grey – integrity, maturity

- **Apply appropriate timesteps for readability.** For hand-outs or take-home material print the paragraph copy in a serif typestyle. This style has been proven to be 30% easier to read. Type that is projected on a screen, using a slide, overhead or multimedia projector, should be in sans serif type. That's because in the projection process letters lose some of their sharpness, and serif type can look muddy when projected.

This is "Times Roman." It is a serif type. Notice the tiny scrollwork on the ends of each letter.

This is "Arial." It is a sans serif type. It does not have the tiny scrollwork on the ends of each letter.

- **Include photographs to inject realism.** The more true to life you make the issue you are presenting, the better your audience will understand and identify with it. Remember the

impact you can add by using photos or video of people on location, using products or talking to the audience.

- **Insert illustrations to clarify or emphasize.** If your topic is complex, an illustration lets you simplify the way it looks. Also, illustrations allow you to show exploded views or views normally not seen, such as interiors.

Computer Presentations

- **Use large fonts.** On your Power Point presentation, use the biggest fonts realistically possible. Small fonts are hard to read.
- **Use contrasting colors.** A dark background with light text is easily readable.
- **Use drop shadows.** Adding drop shadows to text makes it more legible.
- **Avoid busy backgrounds.** Keep the background simple. Too much in the background makes the text hard to read.
- **Avoid using red text.** Red text is often hard to read.
- **AVOID ALL CAPS!** All caps look like you're shouting.
- **Include a good combination of words, pictures, and graphics.** A variety keeps the presentation interesting.
- **Display information by Progressive Building.** The audience responds well to gradually adding information.
- **Incorporate audio into computer presentations.** All rooms have inputs for computer audio. Incorporate sound effects or audio clips into presentations.
- **Try not to rely on the Internet.** If you are displaying web pages or video clips, download them before class and save them to the hard drive/USB flash drive/ etc. Network connections can be slow and unreliable at times.
- **Invest in a wireless pointer/clicker.** It is helpful to be able to advance pages from across the room.
- **Experiment!** The computer is an extremely powerful and flexible tool. There's no end to what it can do.