

San José State University
AE 299 – Aerospace Engineering Master’s Thesis
Fall, Spring, Summer

Course and Contact Information

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|------------------------------|---|
| Instructor-of-Record: | Dr. Nikos J. Mourtos |
| Office: | Engr. 272A |
| Telephone: | 408 924-3867 |
| Email: | nikos.mourtos@sjsu.edu |
| Office Hours: | As posted on AE website |
| Credit: | 3 units; must be taken twice to fulfill the MSAE culminating experience requirement |
| Class Days/Time: | TBA |
| Classroom: | TBA |
| Writing Assistance: | Ms. Heidi Eisips heidi.eisips@sjsu.edu |
| Prerequisites: | Admission to Candidacy for the MSAE degree. Written proposal approved by MSAE Thesis/Project Advisor and AE Chair. |

Course Description

Students perform graduate level research and/or design and/or development, involving aerospace systems or components in consultation with an aerospace engineering faculty member. Students are encouraged to submit and present their work at student and professional conferences.

Course Goals

1. Apply contemporary professional and lifelong learning skills to access and process project related information effectively and efficiently from a variety of sources.
2. Acquire the expertise necessary to work in the analysis and design of aerospace systems with possible specialization in one of the following 2 areas: (a) aircraft design, (b) space transportation and exploration.
3. Improve verbal and written communication skills, including the ability to write aerospace engineering technical reports and conference papers.
4. Improve ability to perform research and work independently to solve open-ended aerospace engineering problems.

Course Learning Outcomes (CLO)

Upon completion of this course students will be able to:

1. Conduct a literature review on an aerospace engineering topic using appropriate sources from the worldwide web, the library, professional journals, conference papers, and technical reports.
2. Use the results of the literature review to define appropriate project objectives.
3. Apply graduate level mathematics, science, and engineering principles to carry out the project using analytical and/or experimental, and/or computational methods.

4. Document the project results in a detailed engineering report following the AIAA (American Institute for Aeronautics and Astronautics) format and guidelines.

Required Text: None

Course Requirements and Assignments

| <i>Fall Semester</i> | <i>Spring Semester</i> | <i>Summer Term</i> | Assignment |
|----------------------|------------------------|--------------------|---|
| September 30 | February 28 | June 19 | 1 st semester: literature review (Chapter 1) 2 nd semester: Chapter 4, 5 or equivalent |
| October 30 | March 30 | July 10 | 1 st semester: Chapter 2 2 nd semester: Chapter 5, 6 or equivalent |
| November 7 | April 7 | July 17 | 1 st semester: End-of-semester report due to Thesis Advisor, Committee members, and Instructor-of-Record for review (minimum: 3 chapters of the final report, to be submitted in the 2 nd semester) 2 nd semester: Final report due to Thesis Advisor, Committee members, and Instructor-of-Record for review |
| December 15 | May 15 | August 10 | 1 st semester: End-of-semester report uploaded on CANVAS with corrections; also due to project advisor and committee members. 2 nd semester: Final report uploaded on CANVAS with corrections; also due to project advisor and committee members. |

Grading Policy

Grades are determined by the thesis / project advisor and committee members based on the criteria shown on the evaluation form included below. However, a formal written report following the posted AE guidelines or a published paper, must be submitted to the Instructor-of-Record before a grade can be assigned.

MSAE Thesis / Project Evaluation Form

| Title | | | | | |
|--------------------------|---|--------------|----------------------|-----------------|-----------------|
| Name | | | | | Semester – |
| Advisor | | | | | |
| Max Possible Score = 100 | | Max Possible | <i>Average score</i> | Project Advisor | Other Evaluator |
| 1 | Application of AE science (aerodynamics, propulsion, flight mechanics, stability & control, aerospace structures & materials, etc.) and/or aerospace vehicle design, appropriate for graduate level | 20 | | | |
| 2 | Use of modern tools (computational or experimental) | 10 | | | |
| 3 | Appropriate literature search (# and appropriateness of references cited) | 10 | | | |
| 4 | Understanding of the cited literature (summary of previous work) | 10 | | | |
| 5 | In-depth analysis and / or design of an AE system | 20 | | | |
| 6 | Correct language and terminology | 20 | | | |

| | | | | | |
|---|--------------------------------------|------------|--|--|--|
| 7 | Appropriate use of graphs and tables | 10 | | | |
| | Total Score | 100 | | | |

Grade Distribution/Overall Score:

| <i>Total Score</i> | <i>Grade</i> |
|--------------------|--------------|
| 80 - 100 | CR |
| 0 - 79 | NC |

Reports Reports are graded for English (grammar, spelling, punctuation, etc.) as well as for technical content. Please see guidelines below. It is highly recommended that you **work with Ms. Eisips** to improve your writing. Email her to make an appointment anytime during the semester. Written reports not meeting minimum writing proficiency standards will be returned without a grade. ***If your report is returned ungraded because of writing issues, you must meet with Ms. Eisips.*** Revised reports may be re-submitted only once.

[AE Department Policies](http://www.sjsu.edu/ae/programs/policies/)

Can be found at <<http://www.sjsu.edu/ae/programs/policies/>>

[University Policies](http://info.sjsu.edu/static/catalog/policies.html)

Can be found at <<http://info.sjsu.edu/static/catalog/policies.html>>

GENERAL GUIDELINES ON PROFESSIONAL REPORT WRITING

Each report must meet minimum standards of professionalism. Unprofessional reports will be **severely downgraded even if** the technical content is correct. The following items explain some of the features of a professional report.

1. All reports must be prepared with a **word processor**.
2. Organize reports using a **decimal numbering system**. The chapters, Sections, Sub-Sections should be indicated as follows:
 4. **Title of Chapter (16 pt.)**
 - 4.1 Title of Section (14 pt.)
 - 4.1.1 Title of Sub-Section (12 pt.)
 - 4.1.1.1 Title of sub-sub-section (12 pt.)
3. Many reports require **calculations**. At least one "hand" calculation **must** be performed and documented for each case in a separate sub-section. These hand-calculations do not have to be typed but should be clearly written and well organized. **If they are lengthy (i.e. more than 2 pages)**, they should be placed in a separate appendix but the results should be discussed in the main body of the report.
4. **All** pages must be numbered. Start the introduction at page 1. Pages in the main body of the report are numbered: 1, 2, 3, etc. Preliminary pages such as Table of Contents, List of Symbols etc. are numbered sequentially: i, ii, iii, iv, etc.
5. A minimum **margin of one inch** must be observed on all pages including graphs, figures, tables, computer print-outs, etc.
6. The report must be written in good **English**. All words must be properly spelled. You are expected to proofread your reports before handing them in.
7. Avoid using sentences longer than 2 lines. If you do not, your report will have a high "**Fog Index**" (i.e. it will be difficult to read).
8. **Do not** use I, You, We, They, etc. in a technical report. Also, **do not** treat an airplane or airplane components as persons, i.e., **DO NOT** write: *the airplane's landing gear is of the retractable type*. Instead, write: *the landing gear of the Cessna 182 is of the retractable type* or, even better, *the airplane has a retractable landing gear*.
9. **Do not use** the words: '**in order to ...**'. Remember, the words 'in order' are nearly always out of order!
10. Make use of the technique called "**bulletizing**".
Instead of: *in this chapter, the results of calculations of wing-loading, maximum lift coefficients, thrust-to weight ratio, lift-to-drag ratio and cruise lift coefficients are presented.*
Write: *In this chapter the following characteristics of the Spartan Jet are presented:*
 - *Wing Loading*
 - *Maximum Lift Coefficients*
 - *Thrust-to-Weight Ratio*
 - *Lift-to-Drag Ratio*
 - *Cruise Lift Coefficient*
11. Make sure that no **symbols** are **omitted** from your equations. Again, it is important to proofread your reports before handing them in!
12. All **equations** must be numbered and numbered sequentially. Within a chapter use a decimal numbering system. For example:
$$X = Y + Z \quad (4.17)$$
13. **References** must follow AIAA rules. Please see AIAA document posted on CANVAS.
14. All **figures** and **graphs** must be **numbered** and numbered sequentially. They must also have descriptive **titles**. Titles must appear **below** the figure. All **axes** must have scale and descriptive **labels** including **units** whenever appropriate. **Curves** must also have descriptive **labels**. All lettering must be at least 3 mm high to be legible! For example:

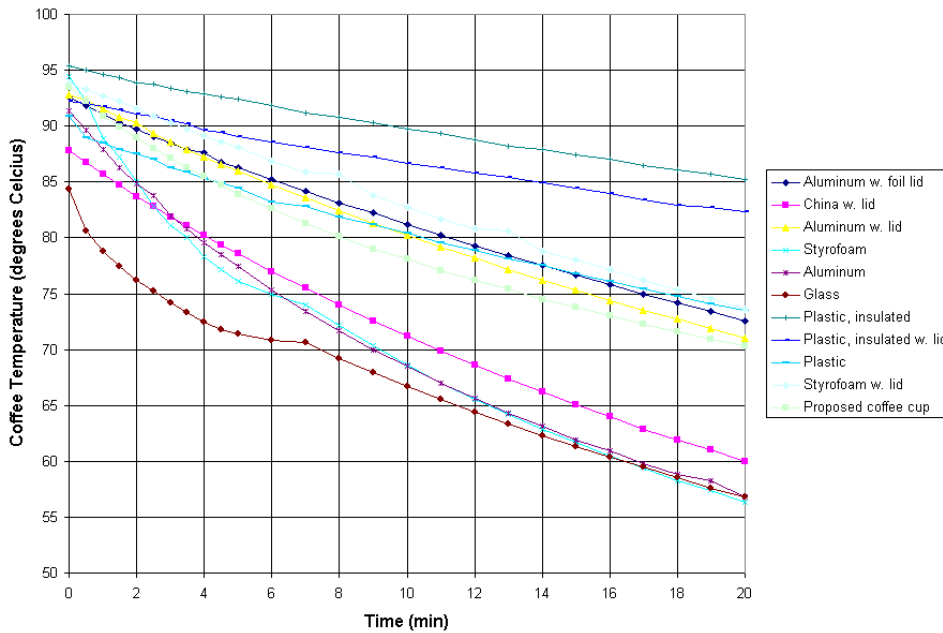


Figure 3.1 – Coffee temperature decline in various cups.

15. All **tables** must be **numbered** and numbered sequentially. They must also have descriptive **titles**. Titles must appear **above** the table. Again, all lettering must be at least 3 mm high to be legible!

Table 5.1 - The heaviest ten airplanes. MTOW = Maximum take-off weight, MLW = Maximum landing weight, TOR = Take-off run ([SL](#), [ISA+15°](#), [MTOW](#)), LR = Landing run (SL, [ISA+15°](#), [MLW](#))

| Type | MTOW [tons] | MLW [tons] | TOR [m] | LR [m] |
|----------------------------------|-------------|------------|---------|--------|
| Antonov An-225 | 640 | | | |
| Airbus A380-800F | 590 | 427 | | |
| Boeing 747-8 | 439.985 | 306.175 | | |
| Antonov An-124 | 405 | | | |
| Airbus A340-500 | 368 | 240 | 3050 | 2010 |
| Boeing 777-300ER | 351.535 | 251.29 | | |
| MD-11 | 273.314 | 195.04 | 3115 | 2118 |
| Ilyushin IL-96M | 270 | 175 | | |
| Boeing 787-9 | 244.94 | | | |
| L-1011-500 | 231.54 | 166.92 | 2636 | |

16. When presenting **aerodynamic data** in a table, graph or figure it is mandatory that you include the following information:

- Reference geometries: S, c and b in ft (or inches) and m (or cm).
- Moment center information in fractions of the m.g.c.
- Airplane weight consistent with the presentation of the data.
- Airplane configuration information, such as:
 - Clean
 - Flaps down, gear up
 - Flaps down, gear down
 - Thrust or power setting
 - Speed brake deployment
 - Flight condition
 - Cg location in fractions of the mgc

17. Remember: **tables, graphs** and **figures** are much easier to understand than **prose** so use them as much as possible.

18. Do not put **lengthy derivations** in the main body of the report. Put such material in an appendix (or appendices) and **summarize** the result in the main part of the report.

19. **Plagiarism** will result in **total loss of credit for the entire report!** If you decide to use

material, which was not generated by you, clearly identify the source of such material.

20. A **list of symbols** must be included in your report. This list must define all symbols used anywhere in the report (including figures, appendices, etc.). Do not include symbols which are not used in your report! Do not copy a list of symbols from another reference! The list of symbols must be presented in the following manner:

| Symbol | Definition | Units (SI) |
|-------------------|----------------------|------------|
| W | Weight | lbs (N) |
| | | |
| Greek Symbols | | |
| α | Angle of attack | deg or rad |
| | | |
| Subscripts | | |
| () _{TO} | Takeoff | ----- |
| | | |
| Acronyms | | |
| APU | Auxiliary Power Unit | ----- |

21. Never make an **unsubstantiated claim!** Example: if you claim that you have optimized airplane weight, you are expected to prove it. If you cannot, do not make the claim!
22. **Avoid** the use of **superlatives**, (e.g. *this is the best airplane ever designed* or *the wing area selected is the smallest possible for this type of airplane*).
23. If you **extrapolate** data or if you extrapolate existing technology, discuss the consequences to your design of not being able to achieve the extrapolated characteristics.
24. Include **units** (both systems) with all your results.
25. Appendices must be sequenced using capital letters and must have specific titles. For example:
 Appendix A - Hand Calculations
 Appendix B - Design Parameters of Comparable Aircraft