San José State University  
AE 299 – Aerospace Engineering Master’s Thesis  
Fall 2019

Course and Contact Information

**Instructor-of-Record:** Dr. Nikos J. Mourtos  
**Office Location:** Engr. 272A  
**Telephone:** 408 924-3867  
**Email:** nikos.mourtos@sjsu.edu  
**Office Hours:** R 11:00 am – 1:00 pm & W 5:00 – 6:00 pm  
**Class Days/Time:** Fridays 4:30 - 7:15 pm  
**Classroom:** Engr. 164  
**Writing Assistance:** Ms. Heidi Eisips, SJSU Graduate Writing Fellow  
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

<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 28</td>
<td>1st written report due: literature review (Chapter 1)</td>
</tr>
<tr>
<td>October 26</td>
<td>2nd written report due (Chapter 2)</td>
</tr>
<tr>
<td>November 26</td>
<td>End-of-semester written report due to advisor for review (minimum: 3 chapters of the final report, to be submitted in the 2nd semester thesis course)</td>
</tr>
<tr>
<td>December 18</td>
<td>End-of-semester written report uploaded on CANVAS with corrections, due to project advisor and Instructor-of-Record.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Max Possible Score = 100</th>
<th>Max Possible</th>
<th>Average score</th>
<th>Project Advisor</th>
<th>Other Evaluator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Application of AE science (aerodynamics, propulsion, flight mechanics, stability &amp; control, aerospace structures &amp; materials, etc.) and/or aerospace vehicle design, appropriate for graduate level</td>
<td>20</td>
<td>20</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>2 Use of modern tools (computational or experimental)</td>
<td>10</td>
<td>10</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>3 Appropriate literature search (# and appropriateness of references cited)</td>
<td>10</td>
<td>10</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>4 Understanding of the cited literature (summary of previous work)</td>
<td>10</td>
<td>10</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>5 In-depth analysis and / or design of an AE system</td>
<td>20</td>
<td>20</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>6 Correct language and terminology</td>
<td>20</td>
<td>20</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>7 Appropriate use of graphs and tables</td>
<td>10</td>
<td>10</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>100</td>
<td>100</td>
<td>Project Advisor</td>
<td>Other Evaluator</td>
<td></td>
</tr>
</tbody>
</table>
Grade Distribution/Overall Score:

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 100</td>
<td>CR</td>
</tr>
<tr>
<td>0 - 79</td>
<td>NC</td>
</tr>
</tbody>
</table>

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

University Policies
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
   4.1 Title of Section
   4.1.1 Title of Sub-Section
   4.1.1.1 Title of sub-sub-section
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:
    \[ X = Y + Z \] \hspace{1cm} (4.17)
13. References must follow AIAA rules.
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)

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

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 mge

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:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
<th>Units (SI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Weight</td>
<td>lbs (N)</td>
</tr>
<tr>
<td>α</td>
<td>Angle of attack</td>
<td>deg or rad</td>
</tr>
<tr>
<td>( )_TO</td>
<td>Takeoff</td>
<td>----------</td>
</tr>
<tr>
<td>APU</td>
<td>Auxiliary Power Unit</td>
<td>---------</td>
</tr>
</tbody>
</table>

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