



Graduate Student's

Thesis/Project Guide Book

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This guidebook is intended to assist graduate students pursuing a MS ME degree with valuable information on how to start a thesis/project and the requirements to complete it towards earning a degree.

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Section 1 - Thesis or Project

Pursuing the thesis option requires preparation of a formal thesis and can require more time to complete than that of the project option. The thesis, however, becomes a published document and may be a valuable component of one's professional achievements. Research documented in a thesis will in many cases also lead to a published article in an archival journal. In general, the thesis option is well suited for analytical, numerical, and experimental research topics of a more original and fundamental nature. Completion of a thesis may also aid in successfully applying for admission to Ph.D. programs at other universities.

The project option typically involves a topic less theoretical and more directly applied in nature than that of the thesis option. Projects frequently entail the design or modification of an existing hardware used in an experiment and/or software development. Completion of a project demonstrates the ability to apply theoretical concepts to a real-world problem and is a valuable achievement for one's professional career. The project option may also be used for a research topic, leading to a conference presentation or being published in an archived journal.

Section 2 - What are the Main Requirements for a Graduate Thesis or Project?

- The graduate thesis is research-oriented work and requires completion of an original research on a mechanical engineering topic. The other requirements include application of advanced engineering concepts and comprehensive written report. The final report must satisfy the guidelines stipulated by the university.
- Graduate projects are application oriented and require application of advanced engineering principles to solve a relevant engineering problem. Similar to thesis, projects also require a comprehensive final report, following guidelines presented in this guidebook.

Section 3 - Graduate Thesis/Project Initiation Process

ME students have the option to complete a total of six (6) units of graduate Thesis, Plan A (ME 299, 3 units each semester) or graduate Project, Plan B (ME 295B) towards their MS/ME degree.

Students are expected to approach a full-time faculty or part-time faculty (preferably related to their area of specialization) to solicit thesis/project ideas or discuss their own ideas (personal interest or work related).

When the 'idea' is approved as a possible Thesis/Project topic, student is expected to prepare a comprehensive proposal following the eight (8) sections outlined on the Graduate Thesis/Project Initiation form, appendix, Document A.

Committee Chair must be a full-time faculty of the department. So if the 'idea' was discussed and initiated by a part-time faculty or a member of industry, then a full-time faculty must be consulted to serve as the Committee Chair. The committee must consist of three members minimum. The other members of the committee could be either full-time faculty or part-time faculty of the department. Committee members may also be from other SJSU college or university departments. The committee may have one industry professional as its third member.

The recommendation of Committee Members to serve on the committee is made by the Committee Chair. The student is expected to contact the recommended committee members, to receive their verbal agreement to serve on the committee. Be sure to let these committee members know that you need their guidance throughout two-semester long study and not just their names and signatures.

Committee Members are expected to add value to your Thesis/Project through their knowledge and expertise. Following verbal approvals from the committee members, offer reviewing the proposal students are expected to complete the Graduate Thesis/ Project Proposal form (word processed or written legibly) including all committee members names and attach to the proposal document. Graduate students are expected to hand-deliver the coversheet (Document B) MSME Project/Thesis Proposal Evaluation Form (Document C) and the proposal to the Committee Chair for approval. Ask the committee chair to route this document to the Graduate Program Advisor and the Department Chair for their evaluation and approvals, respectively.

Once the Thesis/Project proposal is approved by the Committee Chair, Graduate Advisor, and the Department Chair, the student is allowed to enroll in ME 299 or ME 295A course.

Section 4 - Suggestions and Requirements for the Report

Thesis Option

Specific format requirements must adhere to the SJSU thesis option. The University catalog provides some information on format requirements. In addition, the document *General Instructions for Master's Theses* is available (for free) to aid in thesis preparation from the Graduate Admissions and Program Evaluations (GAPE).

In obtaining thesis approval from GAPE, the student must defend his/her thesis. This is accomplished by a successful oral defense of the thesis work to the student's official committee. The oral defense is scheduled by the department. A rough draft of the thesis must also be provided to each committee member two weeks in advance of the defense date. Note that a final hard *bound* copy of the thesis must be given to the advisor (the original must be turned into GAPE office) *and* the department (through the Graduate Coordinator). While not required, it is also customary to offer committee members copies as well.

http://www.sjsu.edu/gape/current_students/deadlines/index.htm

Project Option

The final report for a project is generally similar to a thesis report. A final printed copy (preferably hard bound copy) must be given to your committee chair, and if requested, to the committee members.

Similar to the thesis option, the student is expected to make a formal oral presentation to his/her committee. A rough draft of the project report must also be provided to each committee member two weeks in advance of the defense date. The final bound copies with approved signatures are due to the course instructor/coordinator and Committee Chair within one week after the semester ends.

Section 5 - Thesis/Project Report Writing Guidelines

Thesis or the project report is expected to provide the reader with the important aspects of your work from the start (introduction) to the finish (conclusion).

The content of a Thesis or a Project should include the following components in the outline of the report.

- 1.0 INTRODUCTION
 - 1.1 Literature Review
 - 1.2 Objectives
- 2.0 METHODOLOGY
 - 2.1 Analytical Work
 - 2.2 Computer Simulation
 - 2.3 Experimental Work
- 3.0 RESULTS AND DISCUSSION
- 4.0 CONCLUSIONS/ RECOMMENDED FUTURE WORK
- REFERENCES
- APPENDICES

This outline can be used as a guide to writing. Students are expected to start the report following this outline format and to fill the appropriate sections as they make progress. The initial planning of a report should begin before the work is carried out. The initial planning would help in writing the draft of the report and eventually the final report.

Preparing the outline of the report may consist of several of headings, subheadings, and sub-subheadings which encompass the various sections of the report. A complete outline can be detailed to the point at which each line consists of a single thought or point to be made and will represent one paragraph in the report. Remember that the main headings and subheadings of the outline are usually placed in the report to guide the reader.

The actual writing of the report should be in the form of a rough draft incorporating technical and grammatical skills available to the writer. Do not worry about perfection at this level. This would come during the editing process of reading the rough draft. This consists of improving the rough draft by analyzing and checking the logical thoughts, paragraphs, and punctuations. The final written report would be the result of editing and editing of the rough draft

Students may ask their classmates or the staff of the Campus Writing Center to read their reports for improvement.

Section 6 – Thesis Guidelines

The general organizational format of a thesis is documented in the SJSU General Catalog section 'Master's Degree Thesis' under 'Manuscript Preparations.'

Visit the Graduate Studies and Research website for more information regarding specific guidelines at: <http://www.sjsu.edu/gradstudies/thesis/index.html>

The following link may provide the writer with helpful tips in preparing the thesis:
<http://www.sjsu.edu/gradstudies/thesis/index.html>

Section 7 - Organization of a Project Report

The organization of a Project Report should include:

- Cover Title Page
- Copyright Page
- Signature Page (Does Not Require University Approval)
- ABSTRACT
- ACKNOWLEDGEMENTS
- TABLE OF CONTENTS
- NOMENCLATURE (if applicable)
- LIST OF TABLES (if applicable)
- LIST OF FIGURES (if applicable)
- 1.0 INTRODUCTION (including subsections)
- 2.0 METHODOLOGY (including subsections)
- 3.0 RESULTS AND DISCUSSION (including subsections)
- 4.0 CONCLUSIONS
- REFERENCES
- APPENDICES

Following may provide the writer with helpful tips in preparing the report.

ABSTRACT

An Abstract is a concise and complete summary of the full report. Although it is first in the report, it is always written last. It provides a brief (one sentence) introduction to the subject, a statement of the problem, highlights of the results (quantitative, if possible), and the major conclusion (quantitative). It must stand alone without citing figures or tables or references. Most abstracts are short and rarely exceed 200 words.

INTRODUCTION

An introduction generally identifies the subject of the report, provides the necessary background information, including appropriate literature review, and provides the reader with a clear rationale for the work described. It states the hypothesis or concept tested. The introduction does not contain results and generally does not contain equations. The use of figures and tables should be limited in the Introduction. The introduction section should end by stating the specific goals and objectives of the study. In short, the introduction section should provide the reader with the current state of the topic, the previous research conducted and the need or motivation to carry out to explore this study and the anticipated objectives.

THE METHODOLOGY

Clearly describe the method and means used to carry out the work. The work may require an analytical approach including advanced mathematics and formulation. Or it may require computer simulation using commercially available software such as Finite Element Analysis (FEA) or Computational Fluid Dynamics (CFD) as examples. The work may further require experimental studies using specific tools and apparatus.

ANALYTICAL WORK

The analytical work section describes a proposed theory or a descriptive model, if available. It does not contain results nor should extreme mathematical details be provided. Sufficient detail (mathematical or otherwise) should be provided for the reader to clearly understand the physical assumptions associated with a theory or model.

COMPUTER SIMULATION

The computer simulation modeling should be based on physical modeling of the work to be carried out. All assumptions should be stated clearly. Appropriate commercially available software could be used by justifying its use in the study, preferably following a benchmark study.

EXPERIMENTAL WORK

The experimental work section is intended to describe how experimental results were obtained. Provide an overview of the approach, test facilities, validations, and range of measurements. As a rule of thumb, provide just sufficient detail to allow the experiment to be conducted by someone else wishing to carry out a similar study. Do not give instructions or commands to the reader; rather report what was done. A list of equipment is included in the report. It should be a table in body of the report, or it should be placed in an appendix. Uncertainty analysis information can be described either in this section or in the Results section, or both. In cases in which an analytical, computer simulation and experiment are described, these sections of the report should complement and support each other. The relationship of the analysis to the computer simulation and to the experiment should be clearly stated.

RESULTS AND DISCUSSION

Here you present and discuss your test results and tie them back to your original objectives or hypothesis. Data must be interpreted to be useful. This transforms raw data into useful results. When presenting your results, remember that even though you are usually writing to an experienced technical audience, what may be clear to you may not be clear to the reader. Assuming too much knowledge can be a big mistake, so explain your results even if it seems unnecessary. If you cannot figure them out, say so: "The mechanism is unclear and further examination of this phenomenon is required." Often the most important vehicles for the clear

presentation of results are figures and tables. All of the figures and tables should be numbered and have descriptive titles. Column heads in tables should accurately describe the data that appear in the text of the Results section. Since you have spent significant time in preparing the plots and tables, you are intimately familiar with their trends and implications, the reader needs your insight to understand the results as well as you.

CONCLUSIONS

The Conclusions section is where you should concisely restate your answer to the question, "What do I know now?" It must support or refute your hypothesis. It is not a place to offer new facts, nor should it contain another rendition of experimental results or rationale. In a short summary restate why the work was done and how it was done, and provide a conclusion to the work. An appropriate conclusion might be "The temperature measuring system calibrated in this study was found to indicate the correct temperature over the range 30-250°F with no more than a $\pm 1^\circ\text{F}$ *uncertainty at 95% confidence*". Conclusions should be clear and concise statements of the important findings of a particular study; most conclusions require some quantitative aspects to be useful.

REFERENCES

The references cited in the report must be in a formal list is available to the reader and described in sufficient detail for the reader to obtain the source with a reasonable effort. The references cited must follow specific format shown in appendix, Document F.

APPENDICES

Appendices are sections to place superfluous but possible useful information. They should stand on their own and should not provide information critical to the report that information should be in the main body of the report. Uncertain whether information should be in an Appendix? Ask yourself: If the reader did not read the Appendix, would the report be sufficient? The answer is, it should be!

WRITING TIPS

1. Accuracy is important, but so is consistency. Define all nonstandard terms the first time they are used and stick to those terms and definitions throughout all writing on that subject. Err on the side of clarity if you must err, so that if a particular construction is questionable, add the extra words that make it longer but guarantee its clarity.
2. Don't overdo significant figures. This is one of the surest ways of convincing the astute reader that you are an amateur. How many figures can you reproduce for a given measurement? Use that number.
3. Avoid the use of contractions and possessives and jargon. On occasion, jargon serves a useful function-one of neatly describing or labeling an otherwise troublesome concept or process. Still, use jargon only when your audience will understand it and a simple substitution doesn't exist.
4. Technical writing is often in the third person to focus attention on the subject matter at hand. The active voice is preferred where possible, but choose the style that suits your writing best. The important thing is to communicate effectively.

TEXT AND FIGURE FORMAT

Be sure to allow one and one half inch margins from the left, one inch margin from the right, and one inch margin from the top and bottom. For pages with “landscape” format of a figure or diagram, it is customary to turn the page clockwise to view the content.

Section 8 - Suggestions and Requirements for Presentations

Your presentation should be like telling a story that you know well since you have worked on your project for a long time. Furthermore, your presentation must include application of engineering principle and the associate mathematics.

First Semester (ME 295A/ME 299) Presentation Guideline

You need to focus on introduction of the problem you intend to solve and provide extensive background and literature review. Limited amount of analyses, experimental work is needed here, perhaps bench marking a software or experimenting with data collection on some equipment. Emphasis should be on your research and literature review effort. You should limit your presentation to have 15 to 20 slides and a 25-minute presentation including 10 minutes of questions and answers.

- Slide No. 1: Include thesis/project title, course number, title, your name, presentation date, name of committee members
- Slide No. 2: Personal background such as your first degree, school you earned your degree from, date earned your degree. Your current status such as employment on campus or off-campus, company name and your employment title. Followed by Motivation on why you decided to undertake this project.
- Slide No. 3: Presentation Outline (do not use Agenda) and you should have the following bullets:
- Introduction (brief discussion on the background of the topic of your study), include literature review giving specific author's name, title of their research (that is relevant to your work), their objective(s), and their conclusion(s). Could be several slides. (Slide No. 4, etc.)
 - Objective(s) (state your project goals), one slide only and be brief. Do not include scope of your work! (other slides)
 - Methodology (letting the audience know which method you plan to use to 'solve' your topic such as numerical methods, FEA, experimental, or a survey review of published papers. Present any analysis you have at this time) could be several slides. (other slides)
 - Summary (letting the audience know what you have accomplished so far. You may not want to present a 'future work' at this time and let the audience ask that question and be prepared to respond. Remember, your work is not complete and you do not have any conclusions to your study yet. (other slides)

Second Semester (ME 295B/ME 299) Presentation Guideline

This is your time to shine and prove to the audience that you have met your objectives. You need to provide a comprehensive presentation of your effort by going through a clear introduction to the problem you intended to solve, a complete review of what other researchers had done and how you plan to advance the knowledge related to your topic of study. Be clear and precise results and tabulate data to reflect your hard work. Discuss your findings. Remember that you are doing research and the hypothesis you assumed may not come true. It is ok as long as you present your case clearly and

precisely. And finally, draw conclusions based on your objective(s) you set out. You should limit your presentation to a 55 minute period including a 20-minute question and answer period.

Slide No. 1: Include project/thesis title, course title, presentation date, name of committee members

Slide No. 2: Personal background such as your first degree, school you earned your degree, date earned your degree. Your current status such as employment on campus or off-campus, company name and your employment title. Followed by Motivation on why you decided to undertake this project.

Slide No. 3: Presentation Outline (do not use agenda) and you should have the following bulleted:

- Introduction (brief discussion on the background of the topic of your study), include literature review giving specific author's name, title of their research (that is relevant to your work), their objective(s), and their conclusion(s). Could be several slides. (Slide No. 4, etc.)
- Objective(s) (state your project goals), one slide only and be brief. Do not include scope of your work! (other slides)
- Methodology (letting the audience know which method you plan to use to 'solve' your topic such as numerical methods, FEA, experimental, or a survey review of published papers. Present any analysis you have at this time) could be several slides. (other slides)
- You may not want to present a 'future work' at this time and let the audience ask that question and be prepared to respond. Remember, your work is not complete and you do not have any conclusions yet. (other slides)
- Results and Discussion (present your results, experimental, or simulation or analytical, include charts and graphs, highlight your discussion points. Do not conclude anything in this section rather just discuss your findings.
- Conclusions (provide a summary of why you did this study and conclude the results of your work only. You may conclude that your experimental results did match your analytical or simulation work. You may conclude that your hypothesis was supported through proof of analytical study. You may demonstrate that your developed software can predict the analytical calculations.)

Section 9 - Preparing for the End of the Semester

Please check with your Committee Chair to determine if he/she is satisfied with your progress to allow you to make a presentation. **Please have your Thesis/Project Committee Chair to inform the course coordinator of your availability to make a presentation for the scheduling purposes.**

Presentations are generally scheduled the conference day (the day before finals) however, other times could be scheduled if so desired by you and Thesis/Project Committee Members. But all presentations are to be completed no later than the last day of finals.

A FEW MORE ITEMS TO NOTE:

1. To earn a grade (CR), ME 295A students need to submit a final report with the signed approval of the Committee Chair only. Due date to submit the semester final report is the day after the semester finals.
2. ME 295A students are expected to have a 25-minute presentation time. Your project content presentation should not be longer than 15 minutes and limited to less than 20 slides. You need to allow a minimum of 10-minute period for Committee Members to ask questions.
3. Be sure to bring copies of a) completed 'Oral Presentation and Grade Form,' b) 'record of consultation' with your Committee Members, c) 'Presentation Evaluation' form. (see Documents D, F, F in the appendix).
4. To earn a grade (CR), ME 295B students need to submit a semester final report with all Committee members approved signatures on the last day of the semester final.
5. ME 295B students are expected to have a 55-minute presentation time. Your project content presentation should not be longer than 35 minutes and limited to less than 35 slides. You need to allow a minimum of 20-minute period for Committee Members to ask questions.
6. Be sure to bring copies of a) completed 'presentation and grading form,' b) 'record of consultation' with your Committee Members, c) 'Presentation Evaluation' form. see Documents C, D, E in the appendix).
7. All students (ME 295B and ME 299) are expected to turn in a print copy, approved by the Committee to the course coordinator in order to earn their course grades. ME 295A and ME 299, (1st semester) require the approval of the committee Chair only.
8. All students of ME 295B (second semester) are expected to provide one bound copy of their Project Final Report to the department to be kept in department archives for program assessment purposes. All students enrolled in ME 299 are expected to provide two hardbound copies to the GAPE office and one to the Department.

A FEW MORE NOTES:

The grading in ME 295A, 295B and 299 is based on 'CR' and 'NC.' In exceptional cases, a grade of 'RP' (Report in Progress) could be assigned if there is sufficient evidence that you have completed 'substantial' work towards your Thesis/Project. This is based on the Committee's recommendation. Please note that 'RP' cannot be used in place of an incomplete work!

Section 10 - Forms to Bring to the End of the Semester Presentation Session

All ME 295A/ME 295B/ME 299 students are expected to fill out Documents D, E and F forms and bring to the presentation session.

- ME 295AB/299 Oral Presentation & Grade Form (one copy only to be given to Committee Chair)
- Graduate student & Thesis/Project Committee Chair and Members Consultation Records
- MSME Thesis/Project Assessment Form (one copy for each committee member)
- Signature page for committee members approval for ME 295A, and ME 295B, see appendix, Document I. (Bring a minimum of 3 sheets for Committee members to sign)

Document A
Mechanical Engineering Department
Graduate Thesis/Project Initiation

ME Graduate students are expected to complete a 6-unit thesis or project towards completing their MSME degree from the ME Department.

Students are expected to enroll in the first course of the project/thesis course upon:

1. Satisfactory completion of all conditions for admission, if any,
2. Completion of a minimum of three (3) courses towards the MS degree,
3. Successful completion of the 'Competency in English' requirement (see the University catalog),
4. Admission to Candidacy for Master's Degree.

The Thesis/Project Proposal should include the following headings:

1.0 Name:	Student Name
2.0 Project Title:	Title, topic, or headline for the study
3.0 Background:	Provide an overview of the current state of the topic of your interest
4.0 Objectives:	Describe your specific goals towards advancing the state of the topic.
5.0 Methodology:	Provide a detailed description of how the thesis/project will be carried out. Include a detailed outline of methods used in your analysis and validation. This section of the proposal is very important and should provide a complete picture of your intended study.
6.0 Deliverables	A list of items you will provide such as a software with documentation, developing a new theory with complete justification, or a piece of hardware to demonstrate or prove a concept.
7.0 Timeline:	Your schedule for delivery of the study such as start date, research activities, defining conceptual goals, fabrication of hardware, report submission, semester presentation, and delivery of the semester report.
8.0 References:	10 references minimum providing a background on the topic.

Students are expected to discuss the goals and objectives of the study with a thesis/project committee chair. The Thesis/Project Chair full-time faculty will assist the student in identifying the other committee members for the Thesis/Project.

Document B

Mechanical Engineering Department

[Graduate Thesis/Project Proposal Cover Sheet](#)

Name: _____

SID#: _____

Phone No: _____

Email Address: _____

I wish to register for (**check one**): ME 295A/B (Project) ☐ ME 299 (Thesis) ☐

Project/Thesis Title:

List of Committee Members:

(Obtain oral approval from each before listing)

1. Chair:

Email:

Phone:

2. Committee Member #1:

Email:

Phone:

3. Committee Member #2:

Email:

Phone:

Thesis/Project Proposal:

Attach a project proposal. Include a description of the current state of your topic, how you will advance that state, what you plan to produce or deliver to justify your effort and a schedule for your work. The objective and the procedure for achieving the objecting must be clear and clearly stated.

Estimated Graduation Date:

Student Signature:

Date: _____

Approved:

Committee Chair: .

Date: _____

Graduate Coordinator:

Date: _____

Department Chair;

Date: _____

Document C

MSME Project/Thesis Proposal Evaluation

Proposed Title: _____

Submitted By: _____

Date Submitted: _____

Evaluated By Committee Chair: _____

Date Evaluated: _____

Evaluated By Committee Member 1: _____

Date Evaluated: _____

Evaluated By Committee Member 2: _____

Date Evaluated: _____

Evaluated By Graduate Advisor: _____

Date Evaluated: _____

Criterion	Acceptable				Acceptable w/ Improvement				Unacceptable			
	C o m m i t t e e C h a i r	M e m b e r 1	M e m b e r 2	G r a d . A d v i s o r	C o m m i t t e e M e m b e r	M e m b e r 1	M e m b e r 2	G r a d . A d v i s o r	C o m m i t t e e M e m b e r	M e m b e r 1	M e m b e r 2	G r a d . A d v i s o r
The title used effective wording to communicate the purpose and scope of the study accurately.												
The significance and impact of the endeavor were presented convincingly, and it was evident how the work benefits society or advances state-of-the-art in the topic of study.												
A sufficient literature review was conducted, and it revealed an understanding of relevance to the topic of study. A need that motivates the proposed project was identified.												
A clear engineering objective statement was stated, and it had appropriate technical rigor for graduate level study. Design or performance specifications (if applicable) were explicitly identified.												
A detailed description of the methodology and a realistic implementation plan were described, including required resources, contingency plans, and timeline.												
Tangible deliverables were stated explicitly, in a way that can be objectively measured.												
Wording, style, grammar, and spelling were used appropriately for graduate-level technical writing .												

The proposal complied with all format requirements as stated in the ME 295/299 proposal guidelines.												
Overall , the proposal established high confidence that the endeavor will be completed successfully.												

Document D – First Semester

ME 295A / ME299 (I)
Oral Presentation and Grade Form

To be completed and submitted by the Committee Chair to the ME Department office for processing the Culminating Experience form.

Select: ME 295A ME 299 (I)

Student Name (Last, First): _____ Student ID: _____

Title: _____

Committee Members: 1) (Chair) _____

2) _____

3) _____

Committee Actions

Decision

Reason(s) for disapproval

Draft Report: _____

Presentation _____

Recommended Grade (Pending receipt of Approved Final Report):

ME 299(I) CR/NC: _____ ME 295A Letter Grade: _____

Average Score from the committee (on the scale of 0-4): _____

Comments: _____

Final Report: _____ Date Received: _____

Reasons for disapproval: _____

Signed by:

Committee Chair: _____

Date Signed: _____

Members: _____

Date Signed: _____

Date Signed: _____

Document D – Second Semester

ME 295B / ME299 (II)
Oral Presentation and Grade Form

To be completed and submitted by the Committee Chair to the ME Department office for processing the Culminating Experience form.

Select: ME 295B ME 299 (II)

Student Name (Last, First): _____ Student ID: _____

Title: _____

Committee Members: 1) (Chair) _____

2) _____

3) _____

Committee Actions

Decision

Reason(s) for disapproval

Draft Report: _____

Presentation _____

Recommended Grade (Pending receipt of Approved Final Report):

ME 299(II) CR/NC: _____ ME 295B Letter Grade: _____

Average Score from the committee (on the scale of 0-4): _____

Comments: _____

Final Report: _____ Date Received: _____

Reasons for disapproval: _____

Signed by:

Committee Chair: _____ Date Signed: _____

Members: _____ Date Signed: _____

_____ Date Signed: _____

For Graduate Program Advisor's Action:

Culminating Experience Form Processed on: _____

Graduate Program Evaluator's Signature: _____ Date: _____

Document E
Mechanical Engineering Department
Graduate Student Thesis/ Project Committee Chair and Members
Consultation Records

Graduate students enrolled in Project/Thesis courses are expected to meet with their study committee chairs a minimum of four (4) periods during each semester, preferably, on a monthly basis and at least one meeting with each committee member. Please be sure to take this sheet to your meetings with your study Committee Chair and Members and request acknowledgement.

Date: _____ Time: _____ Committee Chair Signature: _____

Date: _____ Time: _____ Committee Chair Signature: _____

Date: _____ Time: _____ Committee Chair Signature: _____

Date: _____ Time: _____ Committee Chair Signature: _____

Date: _____ Time: _____ Committee Member Signature: _____

Date: _____ Time: _____ Committee Member Signature: _____

Date written draft report received by the Committee Chair: _____ Date: _____

Students are expected to give this sheet to the Committee Chair on their presentation day.

Student Name: _____

Document F

ME295A/ME299-I ASSESSMENT FORM

SAN JOSÉ STATE UNIVERSITY

Student Name:

SJSU ID:

Project/Thesis Title:

☐ ME 295A ☐ ME 299-I

Semester:

Evaluated by:

Date:

Scores are on the scale of 0-4, with 4 indicating strong agreement, and 0 strong disagreement.

	Criterion	Score
1	Motivation for the work was convincing and clear objectives were defined.	
2	A thorough literature search was performed with proper citations, and an understanding of the cited literature was clearly evident.	
3	Understanding of the background theory related to the project topic was demonstrated.	
4	Science and engineering fundamentals were applied appropriately for graduate level work.	
5	Modern tools (analytical, computational or experimental) were used effectively as needed.	
6	Results of the work were presented effectively, using graphs and tables appropriately as needed.	
7	The report was well written, with professional language and correct terminology used throughout.	
8	Key points of the work were summarized effectively and meaningful conclusions were drawn.	
9	The student made timely progress throughout the work, while proactively soliciting and incorporating guidance from the committee.	
10	Overall, the first-semester objectives of the project or thesis are met.	
	AVERAGE:	

Comments:

Grade thresholds:

A = 3.70-4.00,
A- = 3.30-
3.69,
B+ = 3.00-
3.29, B =
2.70-2.99, B-
= 2.30-2.69,

C+ = 2.00-
2.29, C =
1.70-1.99, C-
= 1.30-1.69,
D+ = 1.00-
1.29, D =
0.70-0.99, D-
= 0.30- 0.69,
F = 0.00-0.

ME295B/ME299-II ASSESSMENT FORM**SAN JOSÉ STATE UNIVERSITY**

Student Name: Project/Thesis

SJSU ID:

Title:

☐ ME 295B ☐ ME 299-II

Semester:

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Date:

Scores are on the scale of 0-4, with 4 indicating strong agreement, and 0 strong disagreement.

	Criterion	Score
1	Motivation for the work was convincing and clear objectives were defined.	
2	A thorough literature search was performed with proper citations, and an understanding of the cited literature was clearly evident.	
3	A methodical, in-depth analysis and/or design of a mechanical engineering system was performed, using appropriate assumptions as needed.	
4	Mathematical representations and computations were applied appropriately for graduate level work.	
5	Science and engineering fundamentals were applied appropriately for graduate level work.	
6	Modern tools (analytical, computational, or experimental) were used effectively as needed.	
7	Results of the work were presented effectively, using graphs and tables appropriately as needed.	
8	The report was well written, with professional language and correct terminology used throughout.	
9	Key points of the work were summarized effectively and meaningful conclusions were drawn.	
10	The student made timely progress throughout the work, while proactively soliciting and incorporating guidance from the committee.	
11	Overall, the objectives of the project or thesis were met.	
	AVERAGE:	

Comments:

Grade thresholds

A = 3.70-4.00, A- = 3.30-3.69,
B+ = 3.00-3.29, B = 2.70-2.99, B- = 2.30-2.69,
C+ = 2.00-2.29, C = 1.70-1.99, C- = 1.30-1.69,
D+ = 1.00-1.29, D = 0.70-0.99, D- = 0.30-0.69,
F = 0.00-0.29

Document G

Sample of References

REFERENCES

1. "Mars Exploration Rovers, Mission Overview."
<http://www.nasa.gov/centers/jpl/missions/mer.html>. NASA, 28 July 2008. Web. 21 Mar 2012.
2. "The rover's antennas." http://mars.jpl.nasa.gov/mer/mission/spacecraft_rover_antennas.html. NASA, 04 Oct 2005. Web. 18 Mar 2012.
3. "High Gain Antenna." http://voyager.jpl.nasa.gov/spacecraft/instruments_hga.html. NASA, nd. Web. 18 Mar 2012.
4. "LRO's Antenna." http://www.nasa.gov/mission_pages/LRO/multimedia/lrocraft3.html. NASA, 19 May 2009. Web. 18 Mar 2012.
5. "Model of Mars Reconnaissance Orbiter."
http://www.nasa.gov/mission_pages/MRO/multimedia/083104-mockup.html. NASA, 1 May 2008. Web. 18 Mar 2012.
6. Budynas, R., *Advanced Strength and Applied Stress Analysis, 2nd Edition*. Boston: McGraw Hill, 1999.
7. Segalman, D.; Fulcher, C.; Reese, G.; Field, Jr., R.; "An Efficient Method for Calculating RMS von Mises stress in a Random Vibration Environment." *Journal of Sound and Vibration* 230.2 (2000): pp. 393-410.
8. Chung, Y.; Krebs, D.; Peebles, J.; "Estimation of Payload Random Vibration Loads for Proper Structure Design." *American Institute of Aeronautics and Astronautics, Inc.*(2001):1-10. Print.
9. De la Fuente, E.; "Von Mises stresses in random vibration of linear structures." *Computers and Structures*. 87 (2009):1253-1262.
10. Daneshjou, K.; Fakoor, M., "Efficient Algorithm for Reliability Analysis of Structures under Random Vibration." *Journal of Solid Mechanics and Materials Engineering* 1.1 (2007), pp. 1293 – 1304.
11. MD/MSC Nastran 2010. Dynamic Analysis User's Guide. MSC Software Corporation, Santa Ana, CA, June 25, 2010.

Document H

Sample Thesis Signature Page

The Designated Thesis Committee Approves the Thesis Titled

FAILURE PREDICTION IN GEOTHERMAL PIPPING DUE TO SLUG FLOW

by

Elvis Anderson

APPROVED FOR THE DEPARTMENT OF MECHANICAL ENGINEERING

SAN JOSÉ STATE UNIVERSITY

May 2012

Dr. John Stevens Department of Mechanical Engineering

Dr. Peter Anderson Department of Mechanical Engineering

Mr. Stuart Lee Lockheed Martin Company

Document I
Sample of Project Report Signature Page

SAN JOSE STATE UNIVERSITY

The Undersigned Committee Approves

High Gain Antenna Launch Environment Simulation

Through Vibration Analysis

of

James Scott

APPROVED FOR THE DEPARTMENT OF MECHANICAL ENGINEERING

Dr. Joseph Smith, Committee Chair	Date
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Dr. Jean Michaels, Committee Member	Date
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Mr. Larry Jones, Committee Member Lockheed Martin Company	Date
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Document J
Sample of a Project Report (partial)

LAUNCH ENVIRONMENT SIMULATION THROUGH
VIBRATION ANALYSIS

A Project Presented to
The Faculty of the Department of
Mechanical Engineering
San Jose State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Mechanical Engineering

by
Jane Smith
May 2012

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Jane Smith

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SAN JOSE STATE UNIVERSITY

The Undersigned Committee Approves

Launch Environment Simulation Through Vibration Analysis

of

Jane Smith

APPROVED FOR THE DEPARTMENT OF MECHANICAL ENGINEERING

Dr. Aaron Goldsmith , Committee Chair

Date

Dr. Andrew Watkins, Committee Member

Date

Mr. Edward Williams, Committee Member
Lockheed Martin Company

Date

ABSTRACT

Launch Environment Simulation Through Vibration Analysis

By Jane Smith

A antennas are important components in the communication system between satellites and rovers and the Earth. They need to be designed to survive the launch environments to operate and fulfill their missions. One of the launch environments a component such as an antenna must survive is random vibration. Although a static load estimate could be made to represent the random environment, such as Miles' equation, an accurate RMS von Mises stress is necessary to ensure a design solution that is reliable. A post processing code is developed to calculate the RMS von Mises stress due to a random vibration environment. The code was verified against Miles' equation using a benchmark case with a 13.8% difference.

The objective of this study is to perform a vibration analysis on an antenna to determine if the antenna will survive the launch environments. A vibration analysis was performed on an antenna model and the stress transfer functions were processed using the MatLAB script. In addition, principal stresses and fastener loads were calculated. Yield and ultimate margins of safety were calculated for the antenna parts using the von Mises and principal stresses. Fastener margins of safety were calculated for all joints using the fastener loads. The minimum MS was -0.68 due to a XYZ direction random load, in the bolt joining the Sub reflector to the Truss. The analysis shows that the expected margin of safety of 3 is not achieved and the component would fail due to elevated stresses beyond their yields strength. It is concluded that the design is not robust enough to survive the launch environments and needs to be re-designed with larger bolts or an increased quantity of bolts at all bolted joint locations as well as a material change from 6061-T6 aluminum to 7075-T7351 aluminum.

ACKNOWLEDGEMENTS

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NOMENCLATURE

ASD	-	Auto spectral Density
PSD	-	Power Spectral Density
HGA	-	High Gain Antenna
RMS	-	Root Mean Squared
f_n	-	natural frequency
$E[\]$	-	Expected value
$H(w)$	-	Transfer Function
$()$	-	Complex Conjugate
S_{ff}	-	Input PSD
RSS	-	Root Sum Squared
ζ	-	Zeta, damping factor

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1.0 INTRODUCTION

Twin Mars Rovers Opportunity and Spirit, illustrated in Figure 1, landed on Mars to look for evidence of liquid water in 2004 [1]. The twin rovers have been exploring the Mars surface with their scientific instruments and cameras and have continued relaying data back to NASA through the date this paper was written [1]. The transfer of data was made possible by the high gain and low gain antennas attached to each rover. The high gain antenna (HGA) is a steerable antenna that can send data as a beam of information to a specific receiving antenna on Earth [2]. This was an extremely useful feature since the rover did not need to adjust its position in order to send data out.



Figure 1 - Artists depiction of a Mars Rover.

High gain antennas have been implemented on many space vehicles such as Voyager, Hubble Telescope, Lunar Reconnaissance Orbiter, Figure 2 [3], and the Mars Reconnaissance Orbiter, Figure 3 [4].