Fall 2021 VE496
Lecture notes
Week 3

Group list

4 x 9 + 3 x 2

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	Yiwen Yang	杨毅文
	Haoyang Ling	凌昊洋
	Minglong Yuan	袁茗茏
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	Yiyang Xu	徐逸洋
	Longxing Shi	施龙星
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	Fan Chen	陈帆
	Lang Shen	沈浪
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	Hongxi Tang	汤弘郗
	Songwen Hu	胡淞文
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Group 8	You Wu	吴优
	Shibo Wang	王世博
	Zeyu Sun	孙泽宇
	Shutong Zhang	张疏桐
Group 9	Zhimin Sun	孙智敏
	Shuocheng Chen	陈烁丞
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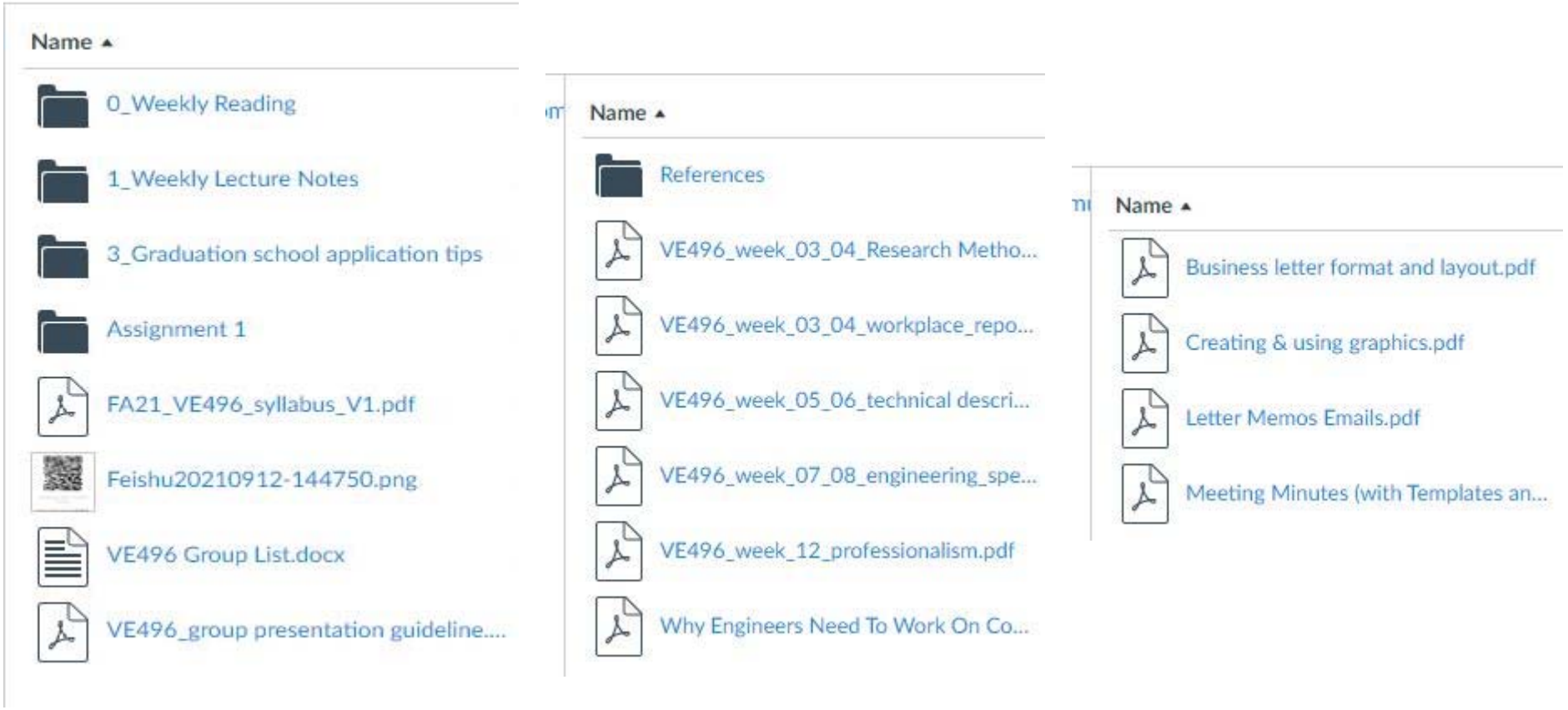
	Xuanjin Jin	金渲晋
	Wentao Zhu	朱闻涛

Canvas course files



Creating a Professional Portfolio

A portfolio is a collection of materials that you can use to demonstrate your qualifications and abilities.

- CV/Resume
- Samples of written work (Statement of Purpose)
- Examples of presentations (remote interview)
- Descriptions and evidence of projects
- Diplomas and certificates & awards
- Letters of reference

Knowledge society puts the **person** in the center

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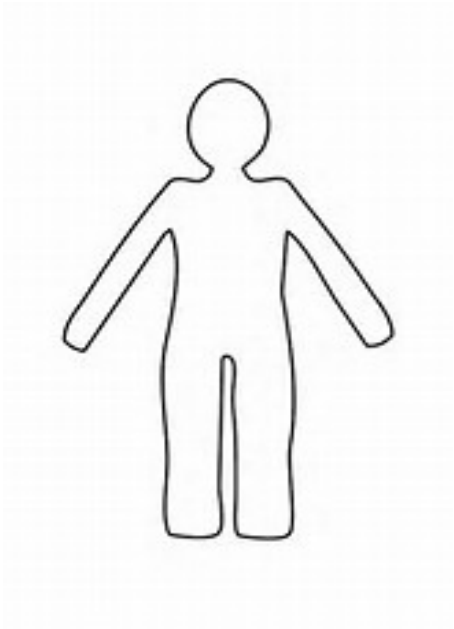
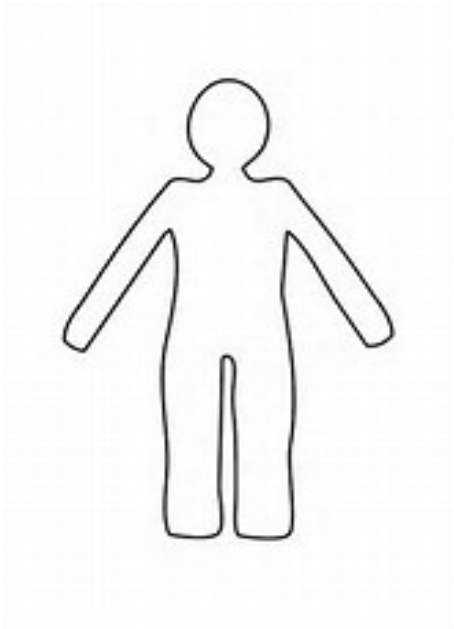


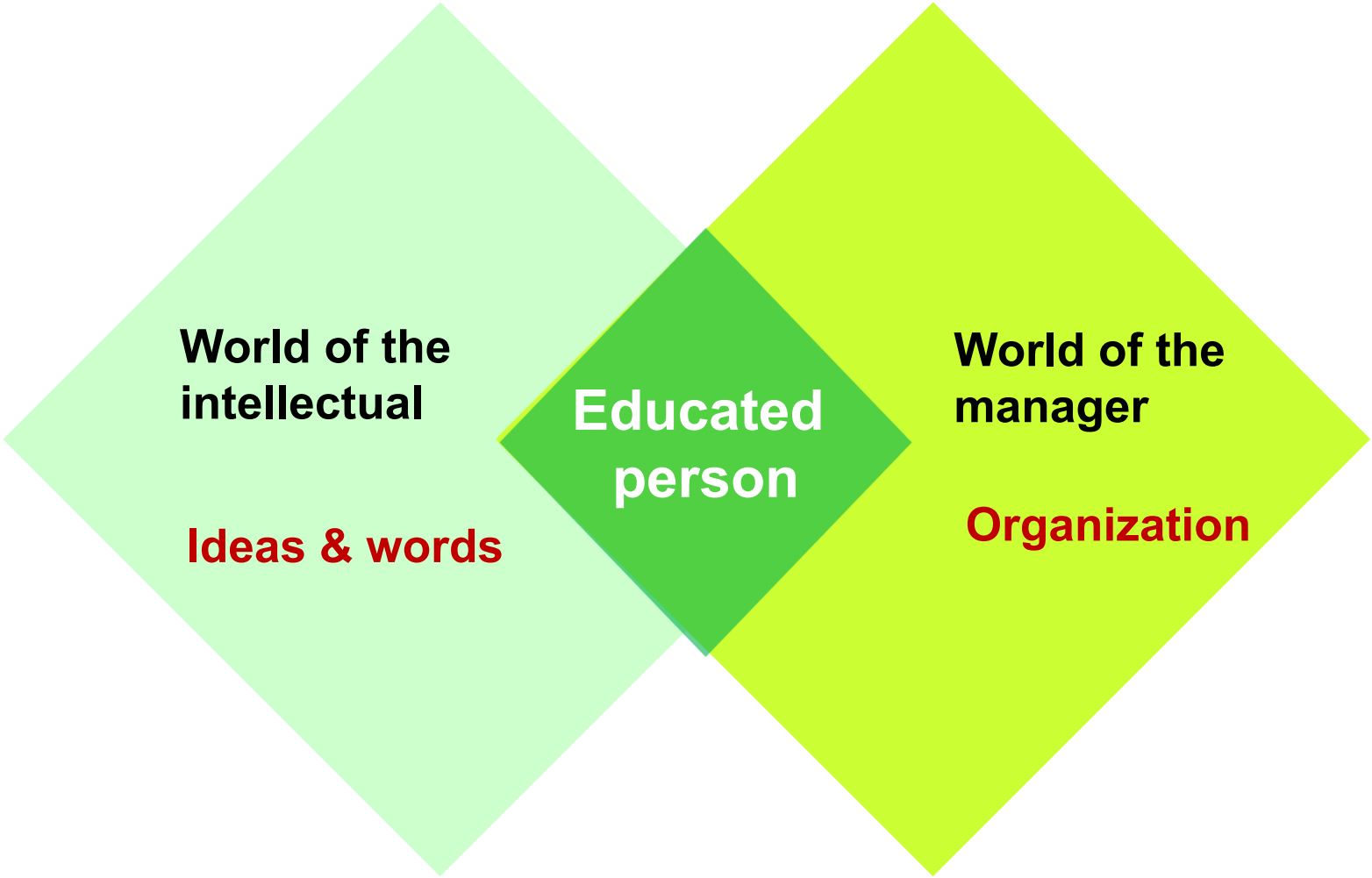
"*With knowledge becoming the key resource, the concept of the "educated person" becomes a crucial matter*."

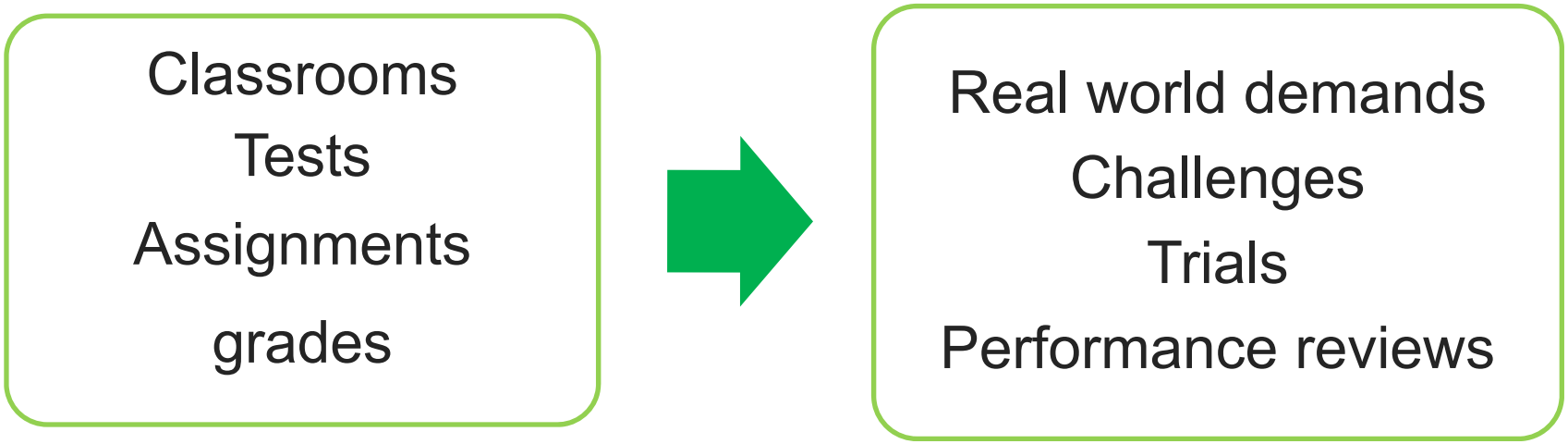
The “**greatest challenge**” will be the change in knowledge :



- in its form and content
- in its meaning
- in its responsibility
- in what it means to be an educated person

"The **educated person** has to be prepared to live an d work simultaneously in **two cultures**"




Classrooms
Tests
Assignments
grades
Real world demands
Challenges
Trials
Performance reviews

Your post graduation plans?

- Graduate school
- Internship
- Job search
- Gap year

Personal purpose, meaning, and value?

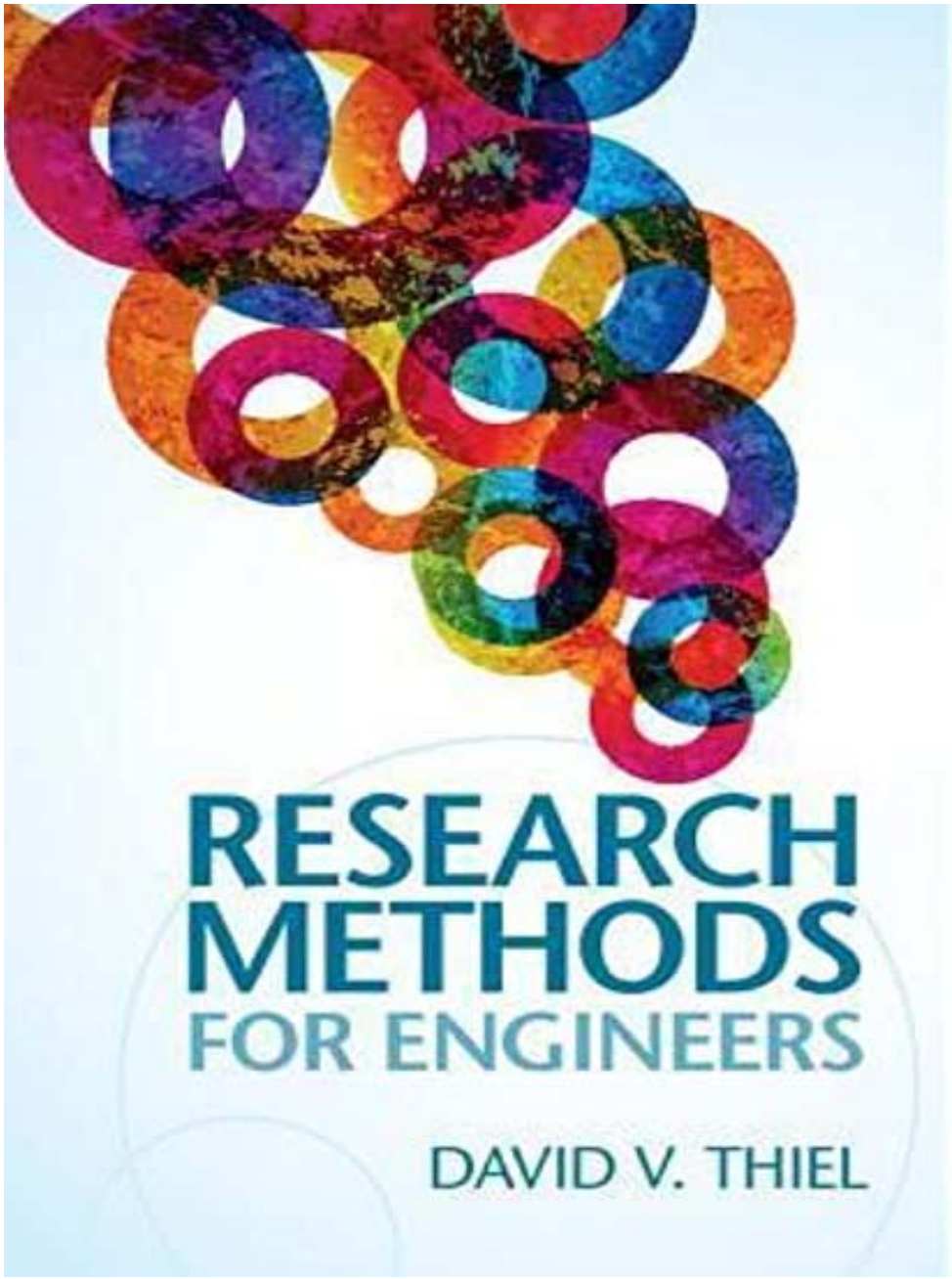
In the US only **27%** of college graduates end up in a career related to their majors.

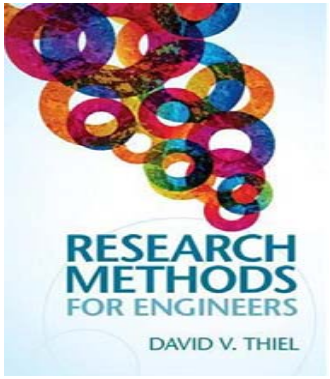
Already on Canvas:

- Bonus individual presentation topics

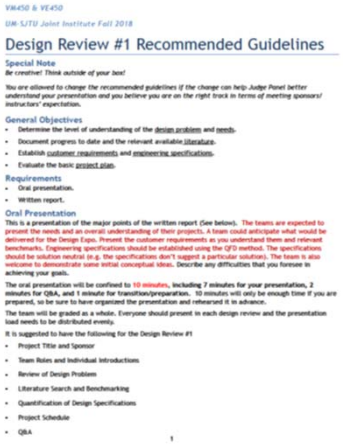
To be created:

- Group presentation topic proposal assignment
- Assignment 1


RESEARCH
METHODS
FOR ENGINEERS
DAVID V. THIEL



VE450/VM450 Capstone Design Review Guidelines #1-4



VM450 & VE450

UM-SJTU Joint Institute Fall 2018

Design Review #1 Recommended Guidelines

Special Note

Be creative! Think outside of your box!

You are allowed to change the recommended guidelines if the change can help Judge Panel better understand your presentation and you believe you are on the right track in terms of meeting sponsors/ instructors' expectation.

General Objectives

- Determine the level of understanding of the design problem and needs.
- Document progress to date and the relevant available literature.
- Establish customer requirements and engineering specifications.
- Evaluate the basic project plan.

Requirements

- Oral presentation.
- Written report.

Oral Presentation

This is a presentation of the major points of the written report (See below). The teams are expected to present the needs and an overall understanding of their projects. A team could anticipate what would be delivered for the Design Expo. Present the customer requirements as you understand them and relevant benchmarks. Engineering specifications should be established using the QFD method. The specifications should be solution neutral (e.g. the specifications don't suggest a particular solution). The team is also welcome to demonstrate some initial conceptual ideas. Describe any difficulties that you foresee in achieving your goals.

The oral presentation will be confined to 10 minutes, including 7 minutes for your presentation, 2 minutes for Q&A, and 1 minute for transition/preparation. 10 minutes will only be enough time if you are prepared, so be sure to have organized the presentation and rehearsed it in advance.

The team will be graded as a whole. Everyone should present in each design review and the presentation load needs to be distributed evenly.

It is suggested to have the following for the Design Review #1

- Project Title and Sponsor
- Team Roles and Individual Introductions
- Review of Design Problem
- Literature Search and Benchmarking
- Quantification of Design Specifications
- Project Schedule
- Q&A

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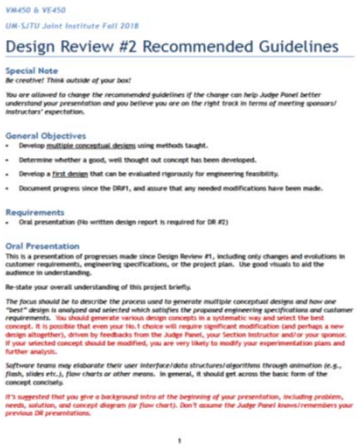

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Design Review #2 Recommended Guidelines

Special Note

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General Objectives

- Develop multiple conceptual designs using methods taught.
- Determine whether a good, well thought out concept has been developed.
- Develop a first design that can be evaluated rigorously for engineering feasibility.
- Document progress since the DR#1, and assure that any needed modifications have been made.

Requirements

- Oral presentation (No written design report is required for DR #2)

Oral Presentation

This is a presentation of progresses made since Design Review #1, including only changes and evolutions in customer requirements, engineering specifications, or the project plan. Use good visuals to aid the audience in understanding.

Re-state your overall understanding of this project briefly.

The focus should be to describe the process used to generate multiple conceptual designs and how one "best" design is analyzed and selected which satisfies the proposed engineering specifications and customer requirements. You should generate various design concepts in a systematic way and select the best concept. It is possible that even your No.1 choice will require significant modification (and perhaps a new design altogether), driven by feedbacks from the Judge Panel, your Section Instructor and/or your sponsor. If your selected concept should be modified, you are very likely to modify your experimentation plans and further analysis.

Software teams may elaborate their user interface/data structures/algorithms through animation (e.g., flash, slides etc.), flow charts or other means. In general, it should get across the basic form of the concept concisely.

It's suggested that you give a background intro at the beginning of your presentation, including problem, needs, solution, and concept diagram (or flow chart). Don't assume the Judge Panel knows/remembers your previous DR presentations.

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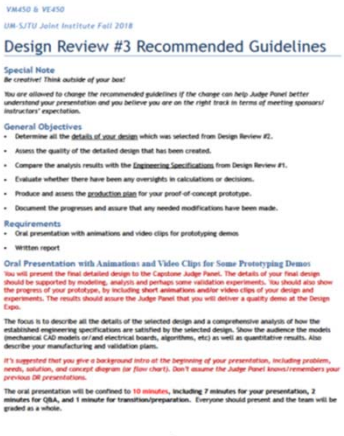

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Design Review #3 Recommended Guidelines

Special Note

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General Objectives

- Determine all the details of your design which was selected from Design Review #2.
- Assess the quality of the detailed design that has been created.
- Compare the analysis results with the Engineering Specifications from Design Review #1.
- Evaluate whether there have been any oversights in calculations or decisions.
- Produce and assess the production plan for your proof-of-concept prototype.
- Document the progresses and assure that any needed modifications have been made.

Requirements

- Oral presentation with animations and video clips for prototyping demos
- Written report

Oral Presentation with Animations and Video Clips for Some Prototyping Demos

You will present the final detailed design to the Capstone Judge Panel. The details of your final design should be supported by modeling, analysis and perhaps some validation experiments. You should also show the progress of your prototype, by including short animations and/or video clips of your design and experiments. The results should assure the Judge Panel that you will deliver a quality demo at the Design Expo.

The focus is to describe all the details of the selected design and a comprehensive analysis of how the established engineering specifications are satisfied by the selected design. Show the audience the models (mechanical CAD models or/and electrical boards, algorithms, etc) as well as quantitative results. Also describe your manufacturing and validation plans.

It's suggested that you give a background intro at the beginning of your presentation, including problem, needs, solution, and concept diagram (or flow chart). Don't assume the Judge Panel knows/remembers your previous DR presentations.

The oral presentation will be confined to 10 minutes, including 7 minutes for your presentation, 2 minutes for Q&A, and 1 minute for transition/preparation. Everyone should present and the team will be graded as a whole.

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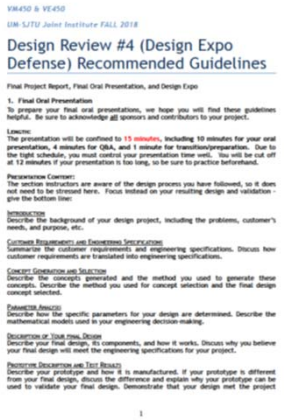

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Design Review #4 (Design Expo Defense) Recommended Guidelines

Final Project Report, Final Oral Presentation, and Design Expo

1. Final Oral Presentation

To prepare your final oral presentations, we hope you will find these guidelines helpful. Be sure to acknowledge all sponsors and contributors to your project.

Length:
The presentation will be confined to 15 minutes, including 10 minutes for your oral presentation, 4 minutes for Q&A, and 1 minute for transition/preparation. Due to the tight schedule, you must control your presentation time well. You will be cut off at 12 minutes if your presentation is too long, so be sure to practice beforehand.

Presentation Content:
The section instructors are aware of the design process you have followed, so it does not need to be stressed here. Focus instead on your resulting design and validation - give the bottom line:

Introduction
Describe the background of your design project, including the problems, customer's needs, and purpose, etc.

Customer Requirements and Engineering Specifications
Summarize the customer requirements and engineering specifications. Discuss how customer requirements are translated into engineering specifications.

Concept Generation and Selection
Describe the concepts generated and the method you used to generate these concepts. Describe the method you used for concept selection and the final design concept selected.

Parameter Analysis
Describe how the specific parameters for your design are determined. Describe the mathematical models used in your engineering decision-making.

Description of Your Final Design
Describe your final design, its components, and how it works. Discuss why you believe your final design will meet the engineering specifications for your project.

Prototype Description and Test Results
Describe your prototype and how it is manufactured. If your prototype is different from your final design, discuss the difference and explain why your prototype can be used to validate your final design. Demonstrate that your design met the project

1

Capstone Design Review #1

VM450 & VE450

UM-SJTU Joint Institute Fall 2018

Design Review #1 Recommended Guidelines

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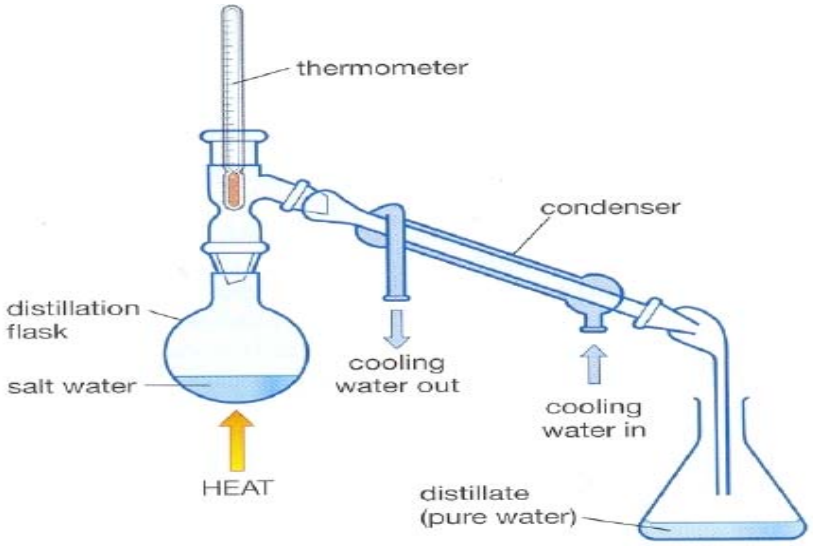
- Quantification of Design Specifications
- Project Schedule
- Q&A

Main Benefit of writing

"The act of writing forces us to ***distill*** vague notions into clear ideas." Thomas Clive



Key words:

1. Research
    a. *Primary research*
    b. *Secondary research*
2. Peer review
3. Archival literature
4. Benchmarking
5. Literature search & review

1. Research

Primary research

- Collect data directly by conducting experiments, surveys, interviews, etc. (You “own” the data).

Secondary research

- Uses data collected from previously done research (citation required).

Work in progress vs. published research results

Academic secondary research tools:

- Online catalogs
- Reference works
- Periodical indexes
- Abstract services
- Government information
- Social media and other interactive resources (online discussion community)

2. Peer review

Evaluation of scientific, academic, or professional work by others working in the same field.

Valid evidence vs. *opinions or factual error*

“Peer-reviewed journal articles”

“Original research”

In evaluating information, did you carefully assess:

- the author's credentials?
- the publisher?
- the author's knowledge of literature in the field?
- the accuracy and verifiability of the information?
- the timeliness of the information?

3. Archival literature = your "research infrastructure"

- Existing body of published scientific literature
- Permanently on record for future scientists & engineers

- Referred journal articles
- Short journal articles
- Conference papers
- Books
- Standards
- Patents
- Theses
- Trade magazine articles
- Newspaper articles
- Infomercials
- Advertisements
- Wikipedia
- Website

4. Benchmarking

To benchmark is to evaluate or check by comparison with an existing standard in various forms such as:

- Research already published by professional peers
- Similar designs/products already on the market
- Previous research and solutions that may have gaps for flaws

What is the added value of your research or product?

What is your unique insight and innovation?

Contextual skills

The *circumstances* that form the setting for an event, statement, or idea

The parts of something written or spoken that immediately precede and follow a word or passage and clarify its meaning
.

5. Literature search & review

All research is grounded in the previous scientific and engineering knowledge

- The relevance of the article to your research project
- The research methods described in the article
- The conclusions reached at the end of the article
- The relationship of the article to other publications

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References cited *vs. bibliography*

A literature review is important because it:

- **Explains** the background of research on your topic.
- **Discovers** relationships between research studies/ideas.
- **Identifies** critical gaps and points of disagreement.
- **Discusses** further research questions that logically come out of the previous studies

Why Write a Literature Review (IR)?

1. **Justifying your own research**. IR allows you to demonstrate what makes your own research valuable. It should serves as a jumping-off point for the rest of your own research.

2. **Demonstrating your expertise.** A well done IR shows that you are able to synthesize and logically present the insights gained. The final product establishes you as a trustworthy authority on your topic.

3. **Joining the conversation**. By producing a literature review, you're engaging with all of the prior scholars who examined your topic and continuing a cycle that moves the field forward.

A good literature review aims to:

- Analyze and critically evaluate the literature
- Synthesize sources to highlight:
  - patterns
  - trends
  - points of consensus
  - points disagreement
  - research gaps
  - open questions that remain

Contextual skills

The *circumstances* that form the setting for an event, statement, or idea

The parts of something written or spoken that immediately precede and follow a word or passage and clarify its meaning
.

Thank you!

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