ME 328 Materials Engineering
Project

Goal: To apply material science knowledge to a problem of material/processing selection and communicate your findings to an audience.

Format: Your group (2 to 4) will create either:

- a poster for inclusion in a poster session
- a web page

Poster sessions are often held at conferences and symposia to complement the oral presentations. In a poster session, authors display their work in posters mounted on bulletin boards or easels that are placed throughout a room. The advantages of this type of presentation are many. The viewers can see the work of many people in a short time without having to sit through dull lectures. The viewer can spend as much time as she pleases with each exhibit and can often talk one on one with the author. Because the format is primarily visual, pictures will be better received than fine print text. Text will be needed of course, but should be in a supporting role.

Web sites are another way of communicating with a lot of people in a short time, but unlike the poster the people don't all have to be in the same room. Like the poster, visual "hooks" are important to attract interest, but the follow-up can contain more text. In our case, the Web page will be evaluated by people who are viewing it for very short periods of time.

Procedure: The suggested procedure will be for each group to

1. *Select an engineered object or device of interest to you.* (For example you may select the body of the Solar Phantom.)
2. *State the design requirements.* (In the case of the car, strength to weight ratio, cost, and ease of manufacture are some of the requirements.)
3. *State what alternative materials/processing are competitive for the application and compare and contrast with respect to the design requirements.* (Metal tube frames, graphite-epoxy monocoques, and bent sheet metal have all been used.)
4. *Select a "best" material/processing and justify your coice with respect to the design requirements.*

Possible choices include:

- armor plate
- soft drink containers
- fork of a mountain bicycle
- automobile spring or driveshaft
- fiber optic cable
- golf ball

Grading:

Grading of the posters will be by instructors and peers. This will result in a composite grade for the poster.

ME 328 Project
Poster Session
Winter 2004-05

Date: Posters will be displayed 9th week
Location: Louise Kahn Room of the Union
Time: TBA
Poster:

- Standard size mat board is 32" by 40". Maximum poster size is 3' by 4'.
- Posters must freely stand on a table and be no more than 16" deep.
- If you display hardware, it can be attached to the poster, or 2-3 small parts may be placed on the table in front of the poster.

Student Evaluation: You are responsible for evaluating half of the posters (evaluate the even numbered posters if your group number is odd and the odd numbered if your group number is even) according to the following scale:

4.0 - Poster meets the stated criteria and is exceptional in all areas.
3.0 - Poster meets the stated criteria and is exceptional in one or more areas, such as visual appearance, clarity of explanations, etc.
2.0 - Poster adequately meets the stated criteria and is of a minimum quality to meet the expected standard of performance for Rose-Hulman juniors.
1.0 - Poster meets some but not all of the criteria and is not up to expected standards for Rose-Hulman juniors.
0.0 - Poster is not there or is entirely inadequate

Evaluation Criteria: These criteria assume you are critically appraising the material selected for use in a particular application (the most common category expected).

1. Does the poster attract my attention and pique my professional interest?
2. Are the design criteria clearly stated?
3. Is the material/manufacture of the part clearly shown?
4. Does the poster tell me how the material/manufacture fulfills the stated design criteria (Are justifications quatitative, clear and convincing)?
5. Are alternative materials/manufacture compared quantitatively to the design choice (with respect to the design criteria)?
6. Is the poster neat, well organized, and professionally done?

Alternative:

Instead of a physical poster, the same work can be done on a virtual poster in the form of a Web page. The same due dates and rules for evaluation apply. The Web site should take no longer to view than a physical poster.

Name _____

ME 328 Project
Poster Session
Winter 2001-02

Group	Topic	Cate-gories						
		Overall	Attract Interest	Design Criteria	Material/ Manufacture	Relate to Design	Alternative Choices	Neat Organized
1								
2								
3								
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22								

Group	Topic	Cate-gories						
		Overall	Attract Interest	Design Criteria	Material/ Manufacture	Relate to Design	Alternative Choices	Neat Organized
23								
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32								
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ME 328 Materials Engineering
Evaluating Sources (esp. Web sites)

Assignment:
As part of your project you will list all your sources in a Reference List, and critically evaluate each listed source. You will assign each source a numerical rating that will reflect the "quality" of the source as defined below.

Introduction: Searching for Truth
Whom do you believe? On the job you will have vendors telling you all kinds of stuff. You will look for information in journals, books, company literature, and web sites. Much of your time will be spent filtering out the crap. The polite name for this is "critically evaluating your sources." Rather than wandering the streets with a lamp, we are going to try to quantify the value of a source.

What makes a good source?
From an engineering perspective a good source is

- Authoritative
- Quantitative
- Unbiased
- Thorough

We are going to look at each of these criteria in turn and try to quantify the quality of our source with respect to each.

Authoritative
If we want to know the density of Osmium at room temperature, the *CRC Handbook of Chemistry and Physics* is more authoritative than Uncle Jake's web site. Authority in science and engineering comes from a history of accuracy and a reputation for knowledge in the field. This is the result of one of the most powerful controls in science, peer review. Consequently, handbooks published by professional societies and articles in refereed journals command considerable respect. Unfortunately, most practicing engineers must get the bulk of their information from trade journals, vendors, and web sites. Therefore, we need some way of rating their authority.

Score	Authoritative
1	Authorship of information is unknown/unclear. Information is of unknown source.
2	Author is known but lacks recognized standing (student, sales people, experts outside their field). Author is not the origin of info and little or no reference to better authority exists. (Most small company web sites fall into this category.)
3	Author has reasonable recognition. Information is referenced to secondary sources.(Trade journal articles are often like this.)
4	Author is recognized and reputable. Information is probably good, but is second hand and is inadequately referenced to a primary source. (Many textbooks fall into this category)
5	Author is recognized and reputable. (Can include college faculty, reputable corporations as well as professional societies) Information was created by the author (GE test data on Lexan) or is adequately referenced to original source. (Refereed journals are in this category)

Quantitative
To be most useful to a designer, engineering information should be quantitative. A vendor can say their new plastic is "better" but it is more useful to know that it is 30% stronger than nylon. Even better is knowing that the material has ultimate tensile strength of 12,000 psi when tested according to ASTM D638. The best information is reported as quantitative values referenced to known engineering standards.

Score	Quantitative
1	Information is in the form of adjectives (better, stronger, lighter)
2	Adjectives have vague reference (lighter than Kevlar, stronger than steel)
3	Information is well defined in a relative sense (material is 30% stronger than cold rolled 1020 steel)
4	Information is numeric without reference to standards (UTS=12,000 psi)
5	Information is numeric and referenced to specific standards. (UTS=12,000 psi per ASTM D638)

Unbiased

If you have ever sold or bought a used car, you know that sales people (including yourself) are not always forthcoming with all the details, especially the disadvantages. Consequently, **no** commercial source can be considered unbiased. They may be authoritative, quantitative, and thorough, but they will not be unbiased.

Score	Unbiased
1	Commercial web sites, press releases, and most short articles in trade journals such as *Machine Design* are simply some form of advertising.
2	The work of only one person or company, rather than information that has be independently verified by other individuals or groups.
3	Comparison articles in trade journals such as *PC Magazine* would fall here. There may be some bias toward reviewing only products that advertise in their magazine, but comparisons are usually quantitative to minimize reviewer bias.
4	Non-commercial sources that still have an ax to grind (Consumer Reports is less biased than Motor Trend because of lack of advertising, but may be biased towards gas mileage and against horsepower as to important comparisons)
5	Includes non-commercial web sites and journals that accept no advertising. The article **must** discuss competitive products and be specific about advantages **and** disadvantages of products. Most handbooks, textbooks, and refereed journals are here.

Thorough

Thoroughness is hard to rate without significant experience. Therefore, for your purposes, this will have to be a relative rating scheme, and you are going to have to look at a lot of sources before one can get a high rating. One heuristic that you can use is "Would you recommend that the readers of your work seek out this source, or would you link it to your own web site on the topic.

Score	Thorough
1	Sketchy information/ no other comparisons/ would not link to web site
2	Best of at least 3 similar sources, probably would not link to web site
3	Best of at least 5 similar sources, may link to own web site
4	Best of at least 7 similar sources, would probably link to own web site
5	Best of at least 10 similar sources, listed on other people's "best of" lists, would definitely link to my own web site.

Further Information

A good place to start looking for more information on evaluating sources is a library. On the Rose-Hulman library web site (http://www.rose-hulman.edu/Library/research/) is the documentation of a workshop on Evaluating Internet Resources. This document formed the basis for this handout and is a good place to start.

Reference List

The reference list will be a list of all sources used in a proper reference format. Accompanying each reference will be a rating in each of the categories and total rating that is the sum of individual category ratings. Your reference list will be evaluated on format and overall "quality".

Your Task

You will need to include several sources of information with your project. Each of these sources should receive a numeric rating in each of the four categories. If all of the sources are biased, at least one should be oppositely biased to the others. For example, if you are reviewing the relative merits of Spectra and Kevlar for body armor, Allied Signal and DuPont will be good references that have opposite biases.

A rating for General Electric's web site for information on Lexan may garner ratings of 5 each for Authoritative, Quantitative, and Thorough, but could not get better than 1 or 2 for unbiased. A rating for material properties from the ASM Metals Handbook may earn a five in all categories. A typical feature article in Machine Design would probably get a rating of (Authoritative-3, Quantitative-3 to 4, Unbiased-2 to 3, Thoroughness-3).

Example:

	A	Q	U	T	Tot
Ashby, M.F., *Materials Selection in Mechanical Design*, Oxford, Pergamon Press, 1992, pp. 123-127.	4	4	5	5	18
Haberle, J.G., and Matthews, F.L., "The Influence of Test Method on the Compressive Strength of Several Fiber-Reinforced Plastics", *Journal of Advanced Materials*, Vol. 25, No. 1, 1993, pp. 35-45.	5	5	5	2	17
Stienstra, David, Personal interview, 21 March 1995.	3	2	3	1	9
www.chaseelastomer.com, Chase Elastomer Corporation on Hypalon Rubber Products	4	3	1	2	9

A - Authoritative
Q - Quantitative
U - Unbiased
T - Thorough