Practices of Modern Engineering

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Texas A&M University

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Lecture 0: About the class

http://rotorlab.tamu.edu/me489
Today’s lecture: **MAIN TOPIC**

**What we will learn today**

**How we will learn it**

**At end: sum knowledge**

**Reading & other assignments:** how & when

**Notes and observations:** other reminders, fill & collect ONE MINUTE PAPER
<table>
<thead>
<tr>
<th>Date: August 30, 2011</th>
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<tbody>
<tr>
<td><strong>Today:</strong> Introduction to Class</td>
</tr>
<tr>
<td>course description &amp; participation</td>
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<tr>
<td>What to expect from this course</td>
</tr>
<tr>
<td>Knowing you better</td>
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<tr>
<td><strong>Reading &amp; other assignments:</strong></td>
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<tr>
<td>Listen to a few <a href="http://engineeringworks.tamu.edu">http://engineeringworks.tamu.edu</a></td>
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<tr>
<td>Read Wisler paper (See Assignment 1)</td>
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<tr>
<td><strong>Other:</strong> complete ONE MINUTE PAPER</td>
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Luis San Andres

Professor at Texas A&M University

26 years experience in engineering and research in rotating machinery: small and big, slow and fast, power generation and thrust for aircraft engines and rocket engines

Personal: two daughters (28) MD at UT Galveston, (20) SHSU student

A reason to develop the course?

Old enough to see the dramatic changes in the world and engineering practices

Class first developed for engineering students at National University of Singapore (2009). Taught also in South Korea and China.

TAMU first in SP 2011 (44 happy customers)
Class schedule

**CE 223** Tuesday & Thursday, 12:45-2:00 pm

**Office hours** Tuesday & Thursday, 11:00-12:00 pm
ENPH 118

**TA:** Sungtae Shin, Ph.D student
sstmir@tamu.edu
End of lecture: One minute paper

Answer, with detail whenever possible, the following TWO questions

(a) What is the most important thing that I learned today?

(b) What remains unexplained from today’s lecture? I want to know more about it or better

Your feedback is important it allows your lecturer to prepare better & you to learn more
## Important references

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Richard Nisbett</td>
<td>$10.20 <a href="http://www.amazon.com">www.amazon.com</a> paperback</td>
<td>The Geography of Thought: How Asians and Westerners Think Differently...and Why</td>
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</table>

Buy the references if possible
### Other resources

<table>
<thead>
<tr>
<th>Engineering Works</th>
<th><a href="http://engineeringworks.tamu.edu">http://engineeringworks.tamu.edu</a></th>
<th>Texas A&amp;M University, Dwight Look College of Engineering</th>
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<tbody>
<tr>
<td>Council on Competitiveness</td>
<td><a href="http://www.compete.org">http://www.compete.org</a></td>
<td>CEOs, University presidents and labor leaders working to ensure U.S. prosperity</td>
</tr>
<tr>
<td><strong>ABET publications</strong></td>
<td><a href="http://www.abet.org">http://www.abet.org</a></td>
<td>ABET, Inc. Accreditation Board of Engineering and Technology</td>
</tr>
<tr>
<td><strong>ASME Publications</strong></td>
<td><a href="http://www.asme.org">http://www.asme.org</a> <a href="http://memagazine.asme.org/Articles/">http://memagazine.asme.org/Articles/</a></td>
<td>ASME American Society of Mechanical Engineers</td>
</tr>
<tr>
<td><strong>ASEE Publications</strong></td>
<td><a href="http://www.asee.org">http://www.asee.org</a></td>
<td>ASEE American Society of Engineering Educators</td>
</tr>
</tbody>
</table>
**....and more resources**

<table>
<thead>
<tr>
<th>TAMU Career Center</th>
<th>WRITING resumes, interviewing tips, decision time!</th>
<th><a href="http://careercenter.tamu.edu/">http://careercenter.tamu.edu/</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>NAE</td>
<td>Achievements</td>
<td>Engineering Greatest Achievements in the 20th Century</td>
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<tr>
<td></td>
<td>A Vision</td>
<td>Engineering Challenges for the 21st Century</td>
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<tr>
<td>National Academy of Engineering</td>
<td>An agenda for American S&amp;T</td>
<td>Rising Above the Gathering Storm <a href="http://www.nap.edu">http://www.nap.edu</a></td>
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<tr>
<td></td>
<td></td>
<td>Energizing and Employing America for a brighter Economic Future</td>
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<tr>
<td>CDIO Initiative</td>
<td><a href="http://www.cdio.org/">http://www.cdio.org/</a></td>
<td>Producing the next engineers</td>
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<tr>
<td></td>
<td></td>
<td>+ TAMU rules, wikipedia, The Economist Texas Board of Professional Engineers</td>
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Class objectives

An Introduction to the **practices of modern engineering:**

a) application of the sciences (mathematics and physics) and engineering principles to satisfy needs, and

b) other tracts that will ensure the engineer’s survival and continued success in the profession

emphasis of this class!
What to expect from this course

You will learn the various skills that an engineer exercises daily in his/her work, the dos & don’ts of practical engineering, the competitive advantages that will keep you ahead.
More outcomes

How to learn to be an active learner

How to get the work done

How to read & write technical reports, scientific papers & how to make technical presentations

How to respect & protect intellectual property
More outcomes

To give you the tools that will enable your survival & success in the modern world of engineering

Management: time, schedules, resources & own career

Team player: how to work & how to communicate with others (your boss)

Responsibility own & world (global village), ethics and safety

Innovation how to learn it, how to practice it.
Your participation is ++ important

The work ahead

Group READING/WRITING Assignments

Three to four students. Read article, search others, write short critical essays. Follow up discussion in class.

Group LISTENING/INFO SEARCHING presentations

Each group selects ONE engineered product or application, prepares presentation showcasing the product specifications & how it’s changed (our) lives.

Team member participation

Learn more & communicate more with others
Group and in class participation
Graded by peers in group and by lecturer
Grades

Group READING/WRITING Assignments 40%

Group LISTENING/INFO SEARCHING presentations 40%

Team member participation 20%

Attendance: no less than 75% time (20/28 lectures)
Listening assignments

Texas A&M University, Dwight Look College of Engineering

Engineering works – archives

http://engineeringworks.tamu.edu

Every week listen to two engineering works casts. Chose one (as a group), make a presentation with valid sources and present it at scheduled time.

Likely: no less than 3 presentations in semester
Reading assignments (Example)

Engineering – What You Don’t Necessarily Learn in School – D. Wisler

Most important paper to prepare you in advance for your professional duties. Paper will be our COMPASS during the course.

http://www.asme.org/publication.htm
Assignment 1


**Assignment:** what is the issue or issues that impacted you more? How to embrace the needs of an engineering career?

Each GROUP meets and prepares a **400 word (max)** essay. Due Thursday **Sept 8** (class time)

One submission per group; HARD & SOFT copies to **lsanandres@tamu.edu** (designate correspondent from group)
A tip about writing

from The Elements of Style, by W. Strunk and E.B. White

“Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should not have unnecessary lines and a machine no unnecessary parts. This requires NOT that the writer makes all his sentences short, or that he avoids all detail and treats his subjects only in outline, but that every word tells.”

ASME: Technical reports and essays AVOID

a) WRITING in first person

b) PASSIVE voice (poor English)
Informal Survey

To know more about you & your needs

**Background:** education, work experience, daily habits & interests

**Why are you in engineering?** What do you think engineering is?

Dreams and potential

**Expectations from this course**

Fill in survey – e-mail it to Lsanandres@tamu.edu
# Course topics so far

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topic</th>
<th>Content</th>
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</thead>
<tbody>
<tr>
<td>8/31</td>
<td><strong>Course description</strong></td>
<td>About this course, contents and grading, what to expect.</td>
</tr>
<tr>
<td>9/1</td>
<td><strong>The modern engineer</strong></td>
<td>Who is an engineer: perceptions and reality, the engineer for 2020</td>
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<tr>
<td>9/6</td>
<td><strong>Engineering Criteria 2000</strong></td>
<td>Importance of accreditation. ABET Criteria 2000. The TAMU ME curriculum</td>
</tr>
<tr>
<td>9/8</td>
<td><strong>Engineering – What you don’t learn in school</strong></td>
<td>The tracts of a modern engineer. The 4 E’s. Differences b/w academia and industry</td>
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</table>
The course syllabus lists a number of (ready) lectures. However, I am more interested in serving your needs rather than those from former students.

Your feedback and questions are very important to set the pace and the content of this course. I will prepare lecture material that is both relevant and practical to you.

Do not be frustrated yet! This is a different type of class.
**Ready topics**

**ABET soft skills** to ensure success in the modern engineering world. Engineering Vision of 2020 as a must for survival in a competitive knowledge base world.

**Engineering & management:** managing your career and engineering your management practices. Why engineers usually do not make good managers? What is needed to be a good manager?

**Engineering your future:** time management now (as a student) and later (as an engineer). Strategies for success in school and in professional life: consistent delivery.
How to keep your job in the future: what are the skills needed for success. How to do more with less, how to do things right the first time.

Cultures – the software of the mind. Difference b/w us and them, how and why? Business in other places: how and how?

Intellectual property: generation, control, and protection. Who owns your ideas?

Diversity (gender and ethnicity) and multiculturalism in the engineering workforce;
Topics

Practicing (enhancing) communication skills, oral and written, with discussions on issues of scholarly research, appropriate use of references, plagiarism, responsible use of open source information, etc.

Ethics in the workplace, do’s and don’ts and discussion on cultural & societal (gender and ethnical based) contexts.

See http://rotorlab.tamu.edu/me489_SP11 for lectures in Spring 2011
Technical Topics

Writing technical memoranda in engineering practice

Uncertainty in engineering measurements and estimations, distinction with errors and how to order sensors

Impedance matching including driver and load performance curves, matching of impedances to deliver maximum power and operation at best efficiency point, concept of driver instability (sure/stall).

Efficiency and sustainability of mechanical systems, clean-energy and oil-free power gas turbine engines for personal transportation.
The hidden costs of outsourcing and how to enable flexible supply chains.

Bridging between eastern and western business practices. About guanxi and losing/saving face and how they apply into western organizational cultures.

The future of engineering & research with Open Sources and Science for & from the Commons.

+ OTHER TOPICS OF STUDENTS’ INTERESTS
Desired Attributes of Engineers

1. A good understanding of engineering science and fundamentals
2. A good understanding of design and manufacturing processes
3. Good communication skills
4. A multi-disciplinary, systems perspective
5. A basic understanding of the context in which engineering is practiced
6. A profound understanding of the importance of teamwork

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<thead>
<tr>
<th>ABET outcomes</th>
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<tbody>
<tr>
<td><strong>a. ability to apply knowledge of mathematics, science and engineering</strong></td>
<td>X</td>
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<tr>
<td><strong>b. ability to design and construct experiments, and analyze and interpret data</strong></td>
<td>X</td>
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<tr>
<td><strong>c. ability to design a system, component, or process to meet desired needs within realistic constraints</strong></td>
<td>X</td>
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<tr>
<td><strong>d. ability to function on multi-disciplinary teams</strong></td>
<td>X</td>
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<tr>
<td><strong>e. ability to identify, formulate and solve engineering problems</strong></td>
<td>X</td>
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<tr>
<td><strong>f. understanding of professional and ethical responsibility</strong></td>
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<tr>
<td><strong>g. ability to communicate effectively</strong></td>
<td>X</td>
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<tr>
<td><strong>h. education to understand the impact of engineering solutions in a global, economic, environmental, and societal context</strong></td>
<td>X</td>
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<tr>
<td><strong>i. recognition of the need for, and an ability to engage in life-long learning</strong></td>
<td>X</td>
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<tr>
<td><strong>j. a knowledge of contemporary issues</strong></td>
<td>X</td>
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<tr>
<td><strong>k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice</strong></td>
<td>X</td>
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## Guest lectures

<table>
<thead>
<tr>
<th>Date</th>
<th>Guests / place of work</th>
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<tbody>
<tr>
<td>Sept 13</td>
<td>Ash Maruyama, Sulzer Tubo (Houston)</td>
</tr>
<tr>
<td>Sept 22</td>
<td>Melissa Wilcox and Chris Kulhanek, Southwest Research Institute (SWRI) (San Antonio)</td>
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<tr>
<td>Sept 29</td>
<td>Shanna Simmons, Shell Westhollow Technology Center (Houston)</td>
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<tr>
<td>Oct TBD</td>
<td>Bugra Ertas, Bearings + (Houston)</td>
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<tr>
<td>Oct 27</td>
<td>Jeff Moore and David Ransom (SWRI) (San Antonio)</td>
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<tr>
<td>Nov 10</td>
<td>Karl Wygnant, Samsung (Houston)</td>
</tr>
<tr>
<td>Nov TBD</td>
<td>Aggies at TU Graduate School (Austin)</td>
</tr>
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</table>

+ your guests. Let me know if you wish to invite a dad/mom, friend, teacher, etc.
Questions?

**Remember:** The course contents is driven by your current needs and interests as well as current and envisioned engineering needs and trends