

MEEN 489/501 Practices of Modern Engineering

Spring 2011

REQUIRED OR ELECTIVE: Elective course

COURSE DESCRIPTION¹: Skills to succeed in a global engineering world: communication and business practices across cultures, managing your career and engineering your management practices, the practice of innovation, keeping your job: how to do more with less and how to do things right the first time. Students interest driven content. . Three credits (3).

PREREQUISITES: Sophomore status or higher,

LECTURER: Luis San Andrés, Mast-Childs Professor of Mechanical Engineering
Room 118 Engineering Physics Building (ENPH), Office Wing
(979) 862 4744, LSanAndres@tamu.edu

TA: Ms. Huanlin ZHU (huanlin@neo.tamu.edu) Office hours: (time and location to be announced)

CLASS time: Tuesday & Thursday, 3:55-5:10 pm ZACH 105C

<http://rotorlab.tamu.edu/me489>

Office hours: T, R: 3:00-3:45 pm, or by appointment (phone call or e-mail in advance).

Two 75 minute sessions: lectures, group discussions and debates, lecturer presentations and (invited) industry guest presentations. Note that this course DOES not follow a traditional lecture format. Course content may change according to students' current interests and trends in the engineering practice.

GRADING:

40% Group Assignments (five to six – every other week)

A GROUP has three (minimum) to six (maximum) members. Groups will complete assignments related to topics presented and discussed in class and based on ASME articles and Engineering Vision 2020. Typical assignments include critical and review essays on various aspects of engineering. Follow up in class discussion.

30% Group Presentations (2 or more)

- (1) Browse <http://engineeringworks.tamu.edu>, select a topic of your interest, and prepare a technical presentation for exposition in the classroom.
- (2) Select a topic of your interest, in particular a field of engineering or application you may have a strong interest.

30% Peer assessment of working in groups

Are you a team player? Group members will assess each member of the team and themselves on various performance characteristics including on time participation, contribution to group goals, attendance and participation in lectures, etc. The ratings will be combined to give a grade to each student in the group.

Grades: A (>90/100), B (>80/100), C (>70/100), D (> 60/100)

Attendance to lectures is +/- MANDATORY. Do come to class at least 75 % of the time (20 out of 27 lectures). Your team members will keep a record of your attendance. They will help you and you will help the group. Your presence and participation are important; I do realize you may have more important things to do; however do help us in making this class worthy of your appreciation and attendance.

¹ The course is NOT traditional in its format or delivery (lecturer delivers material and students listen). The course uses active teaching/learning techniques and feedback with active participation and involvement from the students. The course intends to inform the students of those skills NOT taught in a traditional engineering curriculum and that are vital for success in the engineering world. Please see resources and syllabus.

Final exam: May 10 Tuesday, 1-3 pm (required item) no actual exam will take place; unless you really wish to have one.

MAJOR REFERENCES

National Academy of Engineering	http://www.nap.edu pdf textbooks \$24.50 x 2	The Engineer of 2020: Visions of Engineering in the New Century. Educating the Engineer of 2020: Adapting Engineering Education to the New Century
Geert Hofstede, Gert Jan Hofstede, and Michael Minkov	\$19.77 (www.amazon.com) paperback	Cultures and Organizations: Software of the Mind, 3rd edition
Richard Nisbett	\$10.20 (www.amazon.com) paperback	The Geography of Thought: How Asians and Westerners Think Differently...and Why

Purchasing the references above is not mandatory. However, you are encouraged to acquire these excellent books to enhance your knowledge. Book descriptions given at end of Syllabus

MAJOR RESOURCES

Engineering Works ²	http://engineeringworks.tamu.edu	Texas A&M University, Dwight Look College of Engineering
Council on Competitiveness	http://www.compete.org	CEOs, University presidents and labor leaders working to ensure U.S. prosperity
Lectures	http://rotorlab.tamu.edu/me489	Notes developed by lecturer

ABET publications	http://www.abet.org	ABET, Inc. Accreditation Board of Engineering and Technology
ASME Publications	http://www.asme.org http://memagazine.asme.org/Articles/	ASME American Society of Mechanical Engineers
ASEE Publications	http://www.asee.org	ASEE American Society of Engineering Educators
Ethics in the Workplace	https://sso.tamus.edu	Texas A&M University, Human Resources
Intellectual property	http://www-apps.umuc.edu/primer/enter.php#	University of Maryland University College
Open source	http://en.wikipedia.org/wiki/Open_Access_movement	Open Access links
Plagiarism & misconduct	http://www.tamu.edu/aggiehonor/acadmisconduct.htm	Texas A&M University, student rules
Time management skills	http://college.cengage.com/collegesurvival/downing/on_course/5e/resources.html	Strategies for Success in College
Newspapers and magazines	Various: The Economist, The New York Times, Times, etc.	

Prepared by **Luis San Andrés**

date: January 18, 2011

² <http://engineeringworks.tamu.edu> is broadcast nationwide every Wednesday early morning in a multitude of radio stations, National Public Radio in particular. The program aims to reveal the importance of engineering in shaping our modern world and also to attract or interested young minds into engineering and science.

MEEN 489 Practices of Modern Engineering

COURSE TOPICS

(contents may change depending on students' interests and group presentations)

w	L	Title	Content
1	1	Introduction	Course: description and goals, grading and the work ahead. One Minute paper (feedback). What are the traits of a modern engineer: perceptions and reality. Vision EC 2020: profile of the modern engineer Instructions for Engineering Works. Assignment of groups
	2	EC 2000	Importance of accreditation. ABET Criteria 2000. The TAMU ME curriculum
2	3	What you don't learn in engineering	Discussion on differences between academia and university practices and needs Assignment due: Engineering – What You Don't Necessarily Learn in School
	4	Writing & working in groups	Is working in groups important? Schools change emphasis of English learning from memorization to creativity and group work How to write a technical memorandum. Combining math statements with words.
3	5	Wording is Important	The size of things. An example of motion: zero gravity flight (a fiasco?)
	6	Plagiarism	TAMU policies on plagiarism. Why is it important. How are universities ranked? How is TAMU ranked worldwide. Differences with ranking of US Universities
4	7	<u>Ethics in the workplace</u>	Ethics a cultural value or a universal value? The difference b/w of who you know and what you know
5	8	Engineering is your future	Engineering & management. A call for more scientists and engineers. Opportunities to serve: Engineering w/o Borders
6	9	Engineering Applications	An example of the new century: Microturbomachinery: today and beyond
	10	A little on safety	Are flip-flops safe? What is safety in the workplace? And in the design of mechanical components?
7	11	Uncertainty 1	Understanding Uncertainty in measurements and engineering analysis
	12	Uncertainty 2	Uncertainty in sensors. How was this taught before? Bias and precision errors in sensors
8	13	Impedance I	Concepts of drivers and loads, performance curves. Impedance matching & mismatching. How does a bicycle works?
	14	Impedance II	Driver instability Principles of surge and stall. Example with bicycle. Why is this material not taught in school (any more)? Drivers with various performance curves. How does a variable-speed bicycle works?
			Spring Break March 14-18
9	15	Invention to IP	Forms of intellectual property: patents, copyrights, trade marks & trade secrets. Why is it important? Let's learn on line about IP – take a quiz
	16	Infomercial on graduate school	Pitching graduate school: cost benefit analysis. How to's and when to's. Admission criteria. Finding the right match and opportunities to make money

10	17	What is research (graduate school)	How to get the work done. Necessary conditions and conditioned necessities.
	18		TBD
11	18	Innovation I	Innovation can be thought, managed and stimulated. How is invention different from innovation? The three corners of Eng Vision 2020
	19	Innovation II	Learn innovation: ME Design answer to challenges in modern engineering
12	20	Team rating	Rate effectiveness of the members on your team (fill form). Whistleblower rights. THE ROAD TO CHINA: outsourcing is not cheap & how to build trust
	21	A complete engineer	Engineering is more than just calculations. What is needed to succeed?
13	22	ME 381 survey	Attributes of a good teacher. What must engineering educators teach?
	23	Culture	Business practices here and elsewhere. How do you fit/adapt into a foreign place. Bridging between eastern and western business practices – About guanxi, saving and losing face
14	24	Open sources	Discussion on Open Source and Science for the Commons . Will established science survive/adapt in the future?
	25	Closure	The road ahead.

COURSE LEARNING OUTCOMES:

At the end of this course, students will demonstrate the following knowledge and skills³:

- Practicing 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.
- Making teams that deliver, teams that produce on time and not just delegate;
- *ABET soft skills*⁴ 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.
- Safety as an uncompromising stand in the engineering practice.
- Intellectual property: generation, control, and protection. Who owns your ideas?

³ Course originally developed in Fall 2009 while Dr. San Andrés was on Faculty Development Leave at National University of Singapore (NUS). NUS College of Engineering, world ranked #30, requested Dr. San Andrés develop a course to improve retention of engineering students and to give opportunities for debate and discussion on opportunities in the engineering field. The course format and content has been recommended for implementation in all engineering disciplines.

⁴ *ABET, Inc.* Accreditation Board of Engineering and Technology: a non profit US organization certifying the quality of engineering education in the United States. <http://www.abet.org>

- Diversity (gender and ethnicity) and multiculturalism in the engineering workforce;
- Learning and practicing innovation;
 - Bridging between eastern and western business practices. About *guanxi* and *losing/saving face* and how they apply into western organizational cultures.
 - How to conduct engineering practice and business in China. Why knowledge based engineering and society offers more advantages than other manufacturing hubs.
 - The future of engineering & research with *Open Sources* and *Science for & from the Commons*.

RELATIONSHIP OF THIS COURSE TO ME PROGRAM OUTCOMES:

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

MEEN 489 Practices of Modern Engineering

Policies

About plagiarism: As commonly defined, plagiarism consists of passing off as one's own ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which knowledge and learning cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, under the section "Scholastic Dishonesty."

The textbook, homework assignments, problem sets, lecture notes, exams and handouts (appendices) used in this course are copyrighted. Because these materials are copyrighted, you do not have the right to distribute them freely, unless the author expressly grants permission. Note that material downloaded from the www may be copyrighted. In all cases acknowledge the source of your information. Furthermore, passing as your own computer assignments/projects prepared by former students is NOT acceptable and will automatically bring you into disciplinary action by TAMU.

Americans with Disabilities Act (ADA) Policy Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room B118 of the Koldus Building or call 845-1637.

Texas A&M University complies with the Americans with Disability Act. For this course, that means specifically that I will cheerfully work with identified students to provide appropriate alternative settings for tests and quizzes.

Academic Integrity Statement

Aggie Honor Code: *"An Aggie does not lie, cheat, or steal, or tolerate those who do."*

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information please visit: www.tamu.edu/aggiehonor/

On all course work, assignments, and examinations at Texas A&M University, the following Honor Pledge shall be preprinted and signed by the student:

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

About office hours: The purpose of office hours is to encourage individual interaction between the students and the instructor. The instructor is available to discuss not only questions related to the course, but other issues where he can help as a professional engineer, educator and researcher. Please take advantage of office hours. To utilize this time efficiently, students should prepare by organizing questions in advance.

I am willing to help you at times other than office hours without an appointment. However, just like you, I have responsibilities other than MEEN 489 (teach other classes, direct graduate student research, write proposals and technical papers, organize laboratories, voluntary work for ASME, etc.) I must budget certain times to meet those responsibilities. My weekly work schedule is posted outside my office. Please do not be offended if I am in the office but cannot meet with you.

The use of e-mails for communication with your instructor is acceptable. I usually receive three types of e-mail messages:

- a) a request to schedule a meeting at other times than office hours,
- b) questions related to the impending take-home quiz due (say) next day,
- c) questions related to the study material for an exam.

I reply promptly to all messages (usually within the next working hour if I am in town).

If you cannot find me in my Campus Office, please call me at 862 4744. I spend 60+ hours/week at the Turbomachinery Laboratory (corner of FM2818 and George Bush Dr). At the Turbo Lab I conduct research and manage an excellent team of engineers performing experimental and computational work serving the needs of industrial sponsors.

MAKE UP CLASSES : when will the instructor be absent?

I have scheduled my attendance to several technical Conferences this semester. I will announce the exact date of my absences at least two weeks in advance. Make up recitations for lost classes will be scheduled within a week and conducted at night time (scheduled from 6 p.m. to 8 p.m.).

Feb 23-26 – Congreso Latinoamericano de Turbomaquinaria, Queretaro, Mexico.

Feb XX – PhD Dissertation Defense, Universite de Poitiers, France

About the reference books

Copied from www.nap.org - You can buy the pdf version of the books or read sections on line

The Engineer of 2020: Visions of Engineering in the New Century

\$24.50 http://www.nap.edu/catalog.php?record_id=10999#description

To enhance the nation's economic productivity and improve the quality of life worldwide, engineering education in the United States must anticipate and adapt to the dramatic changes of engineering practice. The Engineer of 2020 urges the engineering profession to recognize what engineers can build for the future through a wide range of leadership roles in industry, government, and academia—not just through technical jobs. Engineering schools should attract the best and brightest students and be open to new teaching and training approaches. With the appropriate education and training, the engineer of the future will be called upon to become a leader not only in business but also in nonprofit and government sectors.

The book finds that the next several decades will offer more opportunities for engineers, with exciting possibilities expected from nanotechnology, information technology, and bioengineering. Other engineering applications, such as transgenic food, technologies that affect personal privacy, and nuclear technologies, raise complex social and ethical challenges. Future engineers must be prepared to help the public consider and resolve these dilemmas along with challenges that will arise from new global competition, requiring thoughtful and concerted action if engineering in the United States is to retain its vibrancy and strength.

Educating the Engineer of 2020: Adapting Engineering Education to the New Century

\$24.50 http://www.nap.edu/catalog.php?record_id=11338

Educating the Engineer of 2020 is grounded by the observations, questions, and conclusions presented in the best-selling book *The Engineer of 2020: Visions of Engineering in the New Century*. This new book offers recommendations on how to enrich and broaden engineering education so graduates are better prepared to work in a constantly changing global economy. It notes the importance of improving recruitment and retention of students and making the learning experience more meaningful to them. It also discusses the value of considering changes in engineering education in the broader context of enhancing the status of the engineering profession and improving the public understanding of engineering. Although certain basics of engineering will not change in the future, the explosion of knowledge, the global economy, and the way engineers work will reflect an ongoing evolution. If the United States is to maintain its economic leadership and be able to sustain its share of high-technology jobs, it must prepare for this wave of change.

Cultures and Organizations: Software of the Mind, 3rd edition

\$19.77 From <http://www.amazon.com>

Geert Hofstede, Gert Jan Hofstede, and Michael Minkov

The revolutionary study of how the place where we grew up shapes the way we think, feel, and act—with new dimensions and perspectives. Based on research conducted in more than seventy countries over a forty-year span, *Cultures and Organizations* examines what drives people apart—when cooperation is so clearly in everyone's interest. With major new contributions from Michael Minkov's analysis of data from the World Values Survey, as well as an account of the evolution of cultures by Gert Jan Hofstede, this revised and expanded edition:

- Reveals the “moral circles” from which national societies are built and the unexamined rules by which people think, feel, and act

- Explores how national cultures differ in the areas of inequality, assertiveness versus modesty, and tolerance for ambiguity

- Explains how organizational cultures differ from national cultures—and how they can be managed

- Analyzes stereotyping, differences in language, cultural roots of the 2008 economic crisis, and other intercultural dynamics

The Geography of Thought: How Asians and Westerners Think Differently...and Why

\$10.20 From <http://www.amazon.com> From Scientific American

Nisbett, a psychologist and Distinguished University Professor at the University of Michigan at Ann Arbor, used to believe that "all human groups perceive and reason in the same way." A series of events and studies led him gradually to quite another view, that Asians and Westerners "have maintained very different systems of thought for thousands of years." Different how? "The collective or interdependent nature of Asian society is consistent with Asians' broad, contextual view of the world and their belief that events are highly complex and determined by many factors. The individualistic or independent nature of Western society seems consistent with the Western focus on particular objects in isolation from their context and with Westerners' belief that they can know the rules governing objects and therefore can control the objects' behavior." Nisbett explores areas that manifest these different approaches--among them medicine, law, science, human rights and international relations. Are the societal differences so great that they will lead to conflict? Nisbett thinks not. "I believe the twain shall meet by virtue of each moving in the direction of the other."