IE 361 Syllabus

Instructor: Stephen B. Vardeman
304-D Snedecor
294-2535
vardeman@iastate.edu
http://www.public.iastate.edu/~vardeman/
Official Office Hours: 2-3:30T, 4R

Grader: TBA

Required Text: Statistical Quality Assurance Methods for Engineers by Vardeman and Jobe

Other References: Probability and Statistics for Engineers by Devore
Basic Engineering Data Collection and Analysis by Vardeman and Jobe

Catalogue Course Description

Prerequisite: Stat 231 or Stat 401

Course Objectives
a. Students will learn the key concepts of engineering quality assessment.

Principles of Measurement and Metrology
Basic Control Chart Methods
Process Characterization and Capability Analysis
Experimental Design and Analysis for Process Improvement

Course Grading:
<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam I</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam II</td>
<td>100 pts</td>
</tr>
<tr>
<td>Exam III (Final)</td>
<td>100 pts</td>
</tr>
<tr>
<td>Labs</td>
<td>30 pts</td>
</tr>
<tr>
<td>Course Project</td>
<td>170 pts</td>
</tr>
</tbody>
</table>

Important Dates:
- Initial Project Proposal Due: T September 19
- Mid-Course Project Interviews: Week of September 25
- Exam I: T October 3
- Project Progress Report Due: T October 24
- Exam II: T November 7
- In-Class Presentations: T December 5
- Evening Poster Session: T December 5 (7:00 PM)
- Written Project Report Due: F December 8
- Final/Exam III: R December 14 (2:15 PM)
- Labs Due: As Announced in Class and by E-mail
Lectures: On WebCT

Labs: Tuesdays, 3:40-5:40, 202 Carver

**Contribution of Course to Meeting the ABET Professional Component**
Students will learn the key basic concepts and methods of quality assurance, and how to apply these concepts and methods in identifying, formulating, and solving problems that are relevant to production and/or service systems. Students will learn the quantitative and analytical techniques typically used in the solving problems associated with quality assurance. Also, students will gain team project experience in quality improvement, in collaboration with area manufacturing and service companies. 3 credits of engineering topics.

**Academic Honesty Statement**
The IMSE Department has an expectation that all students will be honest in their actions and communications. Individuals suspected of committing academic dishonesty will be directed to the Dean of Students Office as per University policy. For more information regarding Academic Misconduct see [http://www.dso.iastate.edu/ja/academic/misconduct.html](http://www.dso.iastate.edu/ja/academic/misconduct.html)

**Professionalism Statement**
The IMSE Department has an expectation that all students will behave in a professional manner during all interactions with fellow students, faculty, and staff. Treating others with respect and having constructive communications are examples of being professional.

**Accommodation for Students with Disabilities**
Iowa State University compiles with the American with Disabilities Act and Sect 504 of the Rehabilitation Act. If you have a disability and anticipate needing accommodations in this course, please contact Vardeman before the end of the 2nd week of the semester. Later requests for accommodations may not be honored. Anyone requesting an accommodation will need to obtain a SAAR form with recommendations for accommodations from the Disability Resources Office, located in Room 1076 of the Student Services Building.
Out-of-Class Group Project / IE 361 / Fall 2006

As part of the requirements for IE 361, you will need to carry out a process-oriented quality improvement project with a (real) client of your own choosing/recruiting. To the extent possible, you should attempt to carry through an iteration of the process-oriented quality assurance cycle laid out in Table 1.1 of the text.

A. Purposes of the Project

The purpose of the project is to practice with the course material and to strengthen your skills of problem formulation and solution, cooperation with others, and professional oral and written communication.

B. Group Size

Group size will be 4 (unless Vardeman gives permission for deviation from this size). Students will organize their own groups. (As soon as a group has organized, please send Vardeman an e-mail naming the members and giving e-mail addresses.)

C. Project Milestones/Reports

1. An initial project proposal is due September 19. This one page report should name the team members and proposed client, and should outline the general area in which the team and client plan to cooperate. Provide contact information for your client (preferably including an e-mail address). Vardeman will meet with your group during the following two weeks to help you formulate a sensible plan of action for your project.

2. An intermediate progress report is due October 24. By this point your problem should be well formulated and an initial plan for solution be agreed upon among team members and client. This progress report should include a careful problem statement, an outline of the planned solution with a time table for completion and a statement initialed by the client indicating his/her agreement with your plans.

3. A three part, professional quality final report will summarize your work on this project. You will produce:
   a) A professional quality display, fitting on one piece of foam (illustration) board (not poster board) between 32x40 inches and 36x48 inches. (This is your chance to tell your story ... the larger size gives you more room to do so.) This display should tell the whole story of your project and be able to stand by itself on an easel or the lip of a chalk board. It must be easily understood from a distance of 6-8 feet (WATCH THE SIZE OF YOUR FONTS!) Make good use of your space on this display. No more than 300 words may appear on this (and many effective displays have had far fewer than this number). We will hold a low key evening "reception"/poster session on Tuesday December 5, where class members, other IE students and faculty, the Engineering deans and project clients are invited to view these displays and talk informally with you about what you accomplished in your project. The IMSE Department faculty will judge posters at this session for semester "Best IE 361 Poster" awards.
   b) An oral report will be presented in class on December 5. Guidelines for this report are:
      i) All team members must participate in the oral presentation.
      ii) Report length (excluding Q&A) will be 12+/-1 minutes. (Practice and time yourselves! Deviations from this guideline will not be well received.)
      iii) PowerPoint will be used. You should begin with a title slide, and produce other (professional quality) slides outlining your main points, giving drawings/schematics of parts or machines you worked on, showing graphical summaries of data you collected and used, etc. Be sure beforehand that these are big and clear enough to be seen by everyone in the classroom. (Watch the contrast and don't use a "busy" background. Read and PAY ATTENTION to the PowerPoint Pointers on the course web page.) Make sure beforehand that your files will work on IMSE equipment. Make and bring with you transparency versions of your slides as a "failsafe" measure, so that if technology fails you, the presentation can go on using an overhead projector. Bring a paper copy of the set of slides for Vardeman to mark up (and comment on your presentation) while you are presenting.
iv) The report should provide adequate background for a listener with no prior knowledge of your client's business or your project, and then go on to emphasize methodology, obstacles overcome and the results/quality improvements obtained.

v) Some time (about 2 minutes) will be allowed for questions and comments from the audience.

c) A single written report from each team is due at Vardeman's office by 5PM on F December 8. This will not be returned, so if you want copies, make them before turning it in. This report must be bound in some form, so that pages can not inadvertently get lost. (A cheap loose leaf binder is acceptable. DO NOT USE a plastic folder that only employs pressure to hold pages in place. Pages always come loose from those!) All pages and all figures should be numbered and all figures should have descriptive captions. All figures should be referred to by number in the text and any items listed in a bibliography or reference section should be explicitly referred to in the text. Some pointers on the writing of technical reports can be found in the document "Writing Short Technical Reports" by Wallace Hopp posted on the course web page. Read that and pay attention to the pointers! The report is to include at least:

i) A title page giving the project title and date, team member names, phone numbers and e-mail addresses, and complete contact information for your client (mailing address, phone number and e-mail address).

ii) A one page executive summary describing the project and main results for your busy engineering manager.

iii) A table of contents for the whole report including appendices. (Include page numbers!)

iv) An introduction giving background to the problem, sketches or photos of equipment involved and a quantitative assessment of the quality situation at the beginning of team involvement. (Be sensitive to matters of corporate security here. Don't photograph anything unless you have explicit permission to do so.)

v) A description of the work done by the team in search of a problem solution/quality improvement. Although details of calculations, data collection sheets, etc. should be deferred to appendices, this section should "tell the whole story" of the team's efforts using whatever prose, graphs, tables, sketches, etc. are needed.

vi) A recommendations/results/project impact section. Ideally, team efforts will lead to recommendations for the client that can be implemented and their impact evaluated and reported in the final write-up. At a minimum, realistic (practically implementable) recommendations and justification for them should be included in the report.

vii) Appendices. Include as appendices carefully documented lists of data collected by the team (include date, technician, unit of measure, etc.), listings of computer programs written for the project, fully annotated computer outputs, detailed "hand" calculations, and copies of the project proposal and progress report. (The relevance of any such appendix material should be immediately clear to the reader. Do not leave a reader guessing why the appendix material was included. Appendix material included should be referred to in the body of the report. Be sure any appendices are clearly labeled!)

viii) The paper copies of your PowerPoint slides marked by Vardeman during your oral presentation.

ix) Sealed envelopes (one from each team member) containing an assessment of percentage of total team effort provided by every team member. (If it becomes clear that the project workload was wildly unbalanced, your instructor may assign different project grades to different team members.)

x) The peer comment sheets from your oral report. (See D. below.)

xi) A receipt from your client indicating that he/she has received a copy of your final written report AND an evaluation by the client of the quality and value of your work to his or her organization in the form of filled out ABET Evaluation Tables, one for each team member. (The blank table will be posted on the course web page so that you and your client can get to it.) This "receipt" and "ABET tables" may be returned to your instructor by e-mail if the client prefers. (In your early discussions with prospective clients, you need to make them aware that your instructor will need this feedback from them.)
Use i) through xi) above as a checklist, and do not fail to include any of these items (except possibly vii) if appendices are not needed.

D. Instructor and Peer Feedback

Vardeman will react in writing to your project proposal and progress report and meet with your group during late September/early October to discuss your approach to your client's situation. Provided you submit them November 28 (and in proposed final form), Vardeman will also provide "free" (ungraded) feedback on your visuals for the in-class presentation (in time for you to correct/improve them before making the presentation). Further, provided you submit (again in proposed final form ... Vardeman will NOT try reviewing a half-baked disorganized document) it by December 1, Vardeman will ("for free," i.e. without any grading consequences) mark up a draft of your written report in time for you to make improvements before turning in the final report on December 8. He will also mark up your final report and prepare a summary sheet of his overall assessment of your work that you may see after course grades are completed.

Your peers will write comments on your oral report that will be given to you at the end of class on your report day. (These and your instructor's comment sheet on your oral report are to be returned with your final written report!)

E. Acceptable Topics and Grading Criteria

An ideal project will focus on a client process producing a good or service, complete a logical analysis of how that process works, formulate appropriate measures of process performance, collect process data, assess and make any changes needed to establish process stability, characterize "stable process performance" and work to the improvement of the process that has been brought into stability. The ideal project has a client who owns the problem/process and works closely with the team, allowing it substantial "hands on" (or near hands on) contact with the process, and stands to gain real benefit from successful project completion. The client could be a manufacturing engineer, a shop manager, a Q.C. analyst, a small business owner, etc. Ideally, techniques used in the project will be drawn from those discussed in IE 361.

It is unlikely that every project team will find an "ideal" project. Project grades will be assigned partially on the basis of topic quality (potential and interest), partially on the basis of the technical merit of the team effort and the real usefulness of the project to the client, and partially on the quality and professionalism of the reports produced by the team (including the proposal, progress report and display). The final report should leave no doubt in the reader's mind that the work done was truly design and not merely "real world" or "data analysis" work.

The project will be graded according to:

- Topic Quality 20%
- Technical Merit/Usefulness 25%
- Display Effectiveness 15%
- Oral Report 15%
- Written Report 25%

Pay attention to this set of guidelines! Your work will be judged against it!