

IME 4920 – Multidisciplinary Senior Project

Thursday, 4:30 – 6:20, D-204 Parkview

Course Syllabus – Fall 2011

Lecturer and

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Office hours: Monday, 1:00 – 2:30 and Thursday, 2:00 – 3:30; others available, *by appointment if possible*

2007 Catalog Data

Open-ended multidisciplinary team projects involving systems design, analysis, or applications. Results in a tangible system, written report, and presentation. This course, when completed satisfactorily with IME 4910, is approved as a writing-intensive course which may fulfill the baccalaureate-level writing requirement of the student's curriculum. *Prerequisite: Grade of "C" or better in IME 4910 and approved project. Co-requisite: IME 4930.*

Writing-intensive Course Note

IME 4920 is a writing-intensive class in which students prepare multiple documents, including a project description for inclusion in the SEDP brochure; an analytical essay on engineering ethics; reviews of professional lectures or opportunities; a professional poster on the project; and either a full, formal project report or a summary project report. Students also give several oral presentations. These communication activities will be evaluated on the basis of the demonstrated content, technical merit, organization, clarity, correctness, and conventions of professional English. Following expectations in professional settings, students are expected to use conventions of professional written, oral, and visual English for all communication activities. Since this class serves in partial completion of the baccalaureate-level writing requirements, students are required to receive a minimum grade of "C" in this class to fulfill curricular graduation requirements. The quality assessment of these project deliverables will comprise the major portion of your final grade in the class.

IME 4920 fulfills the requirement for Writing Courses (Proficiency 2).

Prerequisites by Topic

1. Working technical knowledge of appropriate domain.
2. Understanding of the design process as applied to problem solving.
3. Ability to organize and communicate ideas in written and verbal format.
4. Familiarity with word processing and presentation software.
5. Ability to coordinate and communicate with classmates and faculty.

Evaluation

Grades will be determined based on your project process and performance, with grades given for both individual and team activities. Your IME 4920 and 4930 advisors will evaluate your project. Class attendance, participation, and professional approach will be important for your grade. Course grading will use the following scale:

Outstanding work	A	92-101%
	BA	88-91%
Good work	B	82-87%
	CB	78-81%
Average work	C	72-77%
	DC	68-71%
Unacceptable work	D	61-67%

Failing work

E

60% or below

Course Objectives and Required Activities

Objective 1:

- Work with team and advisors to identify and perform all necessary tasks to complete quality technical project
- Use the design process knowledgeably and effectively to provide client with a satisfactory solution

Objective 2:

- Present written and/or oral team status reports as assigned
- Demonstrate involvement in and support for team activities
- Complete peer-evaluations of team and self performance

Objective 3:

- Analyze and present technical results and make recommendations as appropriate
- Draft, edit, and finalize a complete, well-organized, professional quality project report, adhering to faculty, advisor, and sponsor requirements and needs
- Develop, draft, and finalize professional quality poster of project goals, results, and recommendations
- Present all written work in a professional portfolio under letter of transmittal

Objective 4:

- Give interim oral progress reports and rehearsal presentations
- Review and evaluate taped dress rehearsal for final presentation
- Present project at the Senior Engineering Design Project Colloquium, December 6, 2011
- Understand and answer questions regarding project from the general audience

Objective 5:

- Attend and report on professional development lectures and opportunities (CEAS Lecture Series, professional engineering organizations, other approved professional development activities)

Objective 6:

- Read about and contribute to class discussion on engineering and professional ethics
- Complete written assignment on professional / engineering ethical issues

Assignments and Percentage Values

Engineering ethics segment	8	
Meeting minutes	3	
Draft project report summary)	10	(The project report may be replaced by an executive project summary)
Final project report	12	
Professional quality poster	15	
Lifelong learning	4	
Oral progress reports	12	
“Intro only” to final oral report	2	
Dress rehearsal (SEDP)	10	
Final oral presentation (SEDP)	15	
Peer evaluation	4	
Attendance* / participation	5	

* **Note that attendance is absolutely required; unexcused absences will result in loss of points.**

Grading

Your course grade will be based on your class participation and on your written, oral, and in-class activities. Team activities will typically have both a team grade and an individual evaluation as well. The grading criteria and specifics will be discussed and identified on assignment sheets as appropriate. The quality of work in IME 4920 is expected to be considerably higher than that in IME 4910. In general, I use the following standards in assigning letter grades (or percentage equivalents) on written material:

A Meets or exceeds all the **objectives** of the assignment.
Superior **Content** is mature, is thorough, and addresses audience needs.
Style is clear, accurate, and direct.

Course Objectives (By the end of the semester, the student should...)	Performance Criteria	ABET / TAC Outcomes
Be able to apply technical tools and skills to develop a solution to a problem.	F1. Define technical problem, compare alternative options, and design a solution.	F
Be a contributing member of a project team.	E4. Contribute to team products.	E
Be able to summarize project goals and accomplishments in a format appropriate to situation.	G2. Convey technical information effectively in graphical form (posters, PPT, histograms, FEA outputs).	G
Be able to design and effectively deliver a group presentation of ongoing and completed project activities.	G4. Present information in oral format that is well-organized, useful, and effectively delivered.	G
Seek out and participate in ongoing professional development.	H1. Attend and participate in activities of professional organizations.	H
Participate in and communicate about professional responsibilities and engineering ethics.	I1. Evaluate the ethical dimensions of professional engineering and technological practices.	I

Organization and **format** make information understandable, accessible, and attractive.
Mechanics and **grammar** are correct and meet highest professional standards.

B Good	Meets the objectives of the assignment but needs improvement in style or organization; or contains easily correctable errors in grammar, format, or content; or content is superficial.
C Fair	Needs significant improvement in concept, details, development, organization, grammar, or format; may be formally correct but superficial in content.
D Marginal	Meets some of the objectives but ignores others; content is inadequately developed or contains numerous or major errors.
E Unacceptable	Does not have enough information; or does something other than the assignment required; or contains major errors or excessive errors.

Required IME 4920 Assignments and Project Activities

Engineering Ethics Assignment

The class as a whole will undertake a three-week segment that will require you to discuss and undertake some activities in engineering ethics. You may contribute to the design of this assignment by suggesting activities or readings we should examine. The ethics assignment will involve reading, analysis of resource materials, class discussion, and writing. An assignment sheet will be provided, and each student will submit an insightful and professional quality paper. Participation in the ethics class activities and your individual paper constitutes eight percent (8 %) of your course grade.

Periodic Progress Reports / Meeting Minutes

Weekly progress reports (memo or minutes format) will be directed to both IME 4920 and 4930 advisors, and any industry sponsor(s). Coordinate with your advisors and sponsor to establish when and in what format (written, email, etc.) they want written reports / minutes delivered. Copy all advisors in their preferred format.

Meeting minutes should consist of the following specific items (templates of which you have been provided):

1. Accomplishments since the last meeting.
2. Tasks and information required for the upcoming week, including individual tasks.
3. Scheduled time for activities during the upcoming week.
4. Discussion of the attached Gantt chart.
5. Any additional items that your advisor and/or sponsor wishes reported.

Attach a current/updated Gantt chart to each weekly progress report to indicate your progress. Show your planned vs. actual timelines. Don't delete planned activities when times or milestones change.

Written Group Project Report

All projects must be documented with a professional quality report. Final appearance, writing, and contents of these reports must meet the highest professional standards. For IME4910, the final written report was an interim project report, including a table of contents, list of figures and tables, an abstract, a page of references for the research review, and other materials as discussed in class and on handouts. For IME4920, the final written report will be the full, formal project report, including a letter of transmittal, table of contents, list of figures and tables, executive summary, appropriate appendices, and other materials to be discussed in class and shown on handouts.

You will / have receive(d) handouts, examples, lecture, and discussion on how to compile these professional reports. A preliminary version of each report will be submitted to both Dr. Aller and to your advisor approximately three weeks before the final due date. I will return my copy of this draft with extensive comments and suggestions as soon as possible (first submitted, first returned); you **MUST** request that your technical advisor / sponsor also return comments promptly. I am available to meet with entire teams to work through writing issues and to help as needed. Due dates for draft and final versions of the formal reports will be established early in class. **Note that the draft and the final reports are almost the same point value**; this means the draft needs to be as complete and polished as possible. Also note that you will be working on final written **and** oral reports at the same time; schedule accordingly so that both are complete, polished, and of professional quality.

Professional Project Summary Report Alternative

Alternately, individuals and/or teams that have established in IME4910 that they are already able to produce a quality, professional formal project report may be permitted to substitute a (approximately) 5-page project summary. In this situation, teams will still submit drafts for review, and advisors must support this alternative method of documenting the project. This report will provide a complete summary of the project, and will be accompanied by any appendices necessary to sponsors, advisors, or instructors, as agreed upon by all.

Project Poster

In addition to the final project report, all teams are required to create a professional poster on their project, for display at SEDP and in the halls of Parkview Campus. Posters will be developed through several versions, including outline, story board, and multiple drafts. Teams are advised to take good quality photos of project activities and development throughout the semester for use in posters and presentations. Instruction and examples of professional-quality posters will be provided and discussed.

Reviews of Lectures / Professional Opportunities (Lifelong Learning)

You must attend and respond to a minimum of four lectures or other professional development activities over the course of the IME 4910 / 4920 sequence. Guest lectures typically occur during the semester to enhance senior students' professional development. As a group, we will negotiate which lectures you should attend and any requirements for responses to these lectures. In addition to scheduled lectures, you may attend and report on other professional activities, including conferences/conventions, participation in student professional societies, attendance at university-sponsored events, etc. Be sure to inquire if an activity meets requirements **in advance**.

Periodical Oral Status Reports and Group Presentation(s)

Each team will give two or three oral status reports this semester, as well as an "intro only" segment before the SEDP conference. These oral status reports will be limited to 7 - 9 minutes (unless otherwise indicated), and each individual should present some part of the status report. Note that the audience focus or level of formality required may change from report to report; be aware of these changes and adjust your progress reports accordingly. **Proof of growing progress and depth of results (work product) should be evident**. When appropriate, oral reports should **briefly** address the context of the project and any problems or challenges faced, and may show and discuss the Gantt chart. We will allow additional time for questions from the audience.

Faculty advisors should attend and evaluate these progress reports. *You are responsible for asking your advisor(s) to attend all presentations and providing Dr. Aller with any timing constraints well in advance of the day of presentation.*

Final Presentations (SEDP): Tuesday, December 6, Parkview Campus

A formal, professional oral presentation will be given at the college-sponsored Conference on Senior Engineering Design Projects (SEDP) on Tuesday, December 6. This conference will be advertised inside and outside the university to allow attendance by interested parties throughout the manufacturing and educational communities. The final presentation is limited to 21 minutes total, must have roughly equal contribution from all team members, and will be followed by audience questions. The dress rehearsals for the final presentation will be scheduled for the week before, in class and in our IME 4930 session. Your advisor and other IME faculty will be invited to your rehearsal. The dress rehearsal(s) should be polished and complete, as if you were presenting at the design conference; here again, the “draft” counts nearly as much as the final version. Your rehearsal will be taped, and you must watch the tape and submit an evaluation on your own presentation *before* the SEDP conference.

Individual Design Notebook and Peer Evaluations

Each student maintains an individual design notebook for the duration of the design project. Notebooks may be collected periodically for review and commenting. (See IME 4910 syllabus / handouts for additional details on design notebooks.) Be sure to continue entering information and progress throughout IME 4920. Design notebook entries should detail individual activities, materials reviewed or originated, knowledge gained, decisions reached, and plans for future work. Your individual efforts toward the overall group project and group goals, and discussion and documentation of assignments that were (or were not) completed by you, should be obvious in your design notebook.

As in IME 4910, completion of peer evaluations will be required at least once during the semester. These evaluations allow us to see “behind the scenes” of team activities and participation. These and the design notebook contents will be used for a portion of both “Peer Evaluation” and “Participation” points.

Additional Required Project Materials

Team Project Portfolio

Each design team will provide a “Project Portfolio” in a 3-ring or other professional binder, to be submitted at the end of IME 4920. The portfolio will include the following:

- Bound, archival copy of the final interim report (IME 4910)
- Color, hard copy print out of PowerPoint slides of the final IME 4910 presentation
- Bound, archival copy of the final project report (IME 4920)
- Color, hard copy print out of PowerPoint slides of final IME 4920 presentation (SEDP)
- Color, 8.5 x 11 print of the final project poster (IME 4920)
- A CD or DVD containing electronic files of all documents listed above, including those relevant to the final reports / summary, the PowerPoint slides used for presentations, and any other related electronic files relevant to the project.

The DVD must be well organized, with each file labeled with a clear and unambiguous specific title (e.g., *Final SEDP presentation slides*, not *PowerPoint slides*; *PH Test Bench Final Summary Report*, not *Report File*; etc.). An MS Word format file called “DVD Contents.doc” must be included that lists all files contained on the DVD, with a brief explanation of each file. The DVD should itself be clearly labeled (project title, IME 4920 semester, etc.) and be inserted into a pocket of the portfolio so that it does not become separated from the portfolio.

This portfolio will be submitted to Dr. Aller at the end of IME 4920. *Do not wait* until the end of finals week to compile and submit your final materials. *If requested*, the portfolio may also contain copies of the agenda and minutes

from each project meeting with the advisor and/or industrial sponsor, and other materials produced from group activities.

In addition to the team project portfolio, each IME 4920 team will submit *additional* complete hard copies of the final report or summary: one to [each of] your technical advisor[s], and one to Dr. Aller for grading purposes. You may also need to submit a final report to the project's sponsor. We will discuss appropriate binding of all report copies in class.

Failure to submit an acceptably formatted Team Project Portfolio, the additional reports, and the well-organized DVD will result in a course grade of Incomplete until such time that acceptable materials are received by Dr. Aller.

E-mail Communications

All e-mail communications relevant to the project should be copied to the faculty advisor. It may be beneficial to also include hard copies of these communications in your team project portfolio or to submit them directly to Dr. Aller. Should any concerns regarding team contributions or issues with faculty advisors arise, these copies help Dr. Aller to intercede and assist as necessary.

Ethics in Engineering and Professional Settings

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The purpose of this assignment is to help us all think about ethically significant situations that may arise in our work and professional practice. All of us have been or will be faced with decisions and actions that must take into account these situations. Overlooking, ignoring, covering up, or just being ignorant of their importance is not an option in professional life. So let us begin, in a safe and supportive environment, to explore these issues and our potential responses to them. A secondary objective of this assignment is to continue practicing clear, concise, and insightful writing on engineering topics.

Class Activities

In class (**week 1 of ethics sequence**), we will brainstorm ways in which even seemingly uncomplicated (politically, at least!) activities like our senior projects can have ethical implications and gray areas. We will go beyond the immediate projects to similar issues in current industry and workplace practice. I'm hoping that, as a result, we will all see more clearly how often ethics can play a role in decision making and choices in industry.

I will also show you the link to the Online Ethics Center for Engineering and Science <onlineethics.org>, and we will spend some time cruising this quite complex and rich site. We'll look at a couple of the hundreds of case studies (found in many places under various links and menus) and spend some time with the Lockheed Martin mini-cases ethics game (found under the pull-down menu on the home page – Engineering Practice – Corporate Setting). The goal of these initial activities is to get you thinking about the pervasiveness and importance of ethical choices in virtually all aspects of professional life. I have a number of texts on engineering and ethics issues you may wish to check out. At the end of the first class period, I will encourage you to continue exploring this website, your own experiences, and ways to shape a paper on ethics that would be meaningful to you. In class the following week, you should be prepared to discuss what actions you've taken toward these goals.

The Assignment

Thursday (week 2 of ethics sequence): Come to class with written notes (to turn in if asked) on steps you've taken in the past week to further explore the ethical issues raised in class the previous week. Be prepared to talk about specific sites, links, readings, analysis, interests, etc. I'm anticipating quite a bit of time spent on the Online Ethics site. Say how you'd like to develop your findings into a written brief report, article, etc. Your contribution to this discussion and evidence of progress counts significantly toward your grade in this assignment. At this time I will provide you with the paper I wrote in response to this ethics assignment. You may use it as a model in terms of organization or way to explore ethical dilemmas or gray areas if you wish.

Thursday (week 3 of ethics sequence): Each student will submit a brief report on some aspect of engineering ethics. This can be based on a number of sources, including:

- One of the topics we have discussed, providing it has sufficient substance to build on.
- A case study or ethics problem found on the Online Ethics Center web page.
- An exploration of professional codes of ethics and their application / value in real world situations.
- Or....? Some other ethics situation you find that is substantial and worthy of exploration.

Your written report should be, first and foremost, thorough and insightful. This means not waiting until the night before; if you do that, the result will be poor and will deserve a poor response (i.e., BAD grade). Take the time to read, reflect, think critically, make notes, read and think some more, and write well. Recognize that this writing assignment will be a major portion of your individual writing grade in this class. Superficial and inarticulate writing will fail, as will a paper written for a different purpose / class, or a paper that is not in your own voice (i.e., plagiarized). Your report is due **on or before our class day, week 3 of the ethics sequence: no exceptions.** Your grade will be based on class discussions and your written report; this is worth 8% of your overall grade in IME 4920, plus a portion of your participation grade.

(continued)

Ethics in Engineering and Professional Settings – page 2**Specifics**

Your ethics report (and mine) should meet the following requirements, which I suggest you check off as you complete the assignment:

- The professional standard of format that we've established in this class
- At least 2 full pages (single-spaced) of *tight, clear* writing
- Our usual 1" margins, 11 or 12 pt. serif font, double space between non-indented paragraphs
- Our usual specific and useful title and headings
- Great organization, including introduction (and intro to sections as necessary), topic sentences, conclusion, etc.
- Absolute perfection in mechanics, grammar, sentence structure, word choice, etc.
- Not a word wasted—tight, clear, graceful, articulate phrasing throughout
- An original paper, for this purpose, this course, this point in time. Your thoughts, your voice.
- Finally, be interesting, thought-provoking, well-reasoned, and demonstrate your awareness of the need for and practice of professional ethics.

Overview of Senior Design *Formal Reports*

Letter or Memo of Transmittal (your choice or may depend on advisor; letter is more formal)

Cover Page

Table of Contents - 1st, 2nd, sometimes 3rd-level headings. Also include separate List of Figures and Tables – on same page or on the next page if too long to fit on same page as T of C.

Executive Summary or Abstract (in this case, Executive Summary for the final report) – a handout will be provided, with examples, for writing this summary of the report

Introduction (typically includes, although these may not be the actual headings used):

Overview, including benefits of project

Project Definition and Objectives (these can set the organization of all subsequent sections)

Project Scope and Deliverables

Background (includes technical research review material)

Methodology / Project Plan (typically includes):

Narrative of Plan (this is *not* a heading, but rather the content / discussion expected here)

Timeline (one-page Gantt chart in report; any expanded versions in the appendices)

Budget (may be included in discussion, rather than a specific heading)

Results (data, test results, outcomes, etc. – *what you got*)

Discussion (analysis, interpretation, etc.; sometimes combined with Results)

Conclusions (the “big picture” –the larger outcomes, the *significance* of what was done)

Recommendations (*what specific actions should be followed?* – further testing, next steps, etc.)

Acknowledgements (use equitable forms of address for everybody – Dr., Mr., Ms. – and spell correctly!)

References (use APA or other required citation method; be absolutely consistent)

Appendices (each one with a title; e.g., Appendix A: Sample Calculations) – These represent supplemental information not crucial to understanding the report.

This is a typical approach to engineering project reports. There are a number of variations on this theme, and certain managers (advisors) may prefer some adjustment. But this is the standard organization and addresses the general approach. If we substitute the summary report for the full formal version, I will provide an overview for that.In fact, I did – see next page.

Overview of Senior Design *Summary Reports*

Letter or Memo of Transmittal (your choice or may depend on advisor; letter is more formal)

Cover Page

Abstract (may be helpful to executive readers; use an updated version of your SEDP blurb, on separate page, not counted in your five-page allotment)

Introduction (typically includes, although these should not be the actual headings used):

Overview, focusing on need for and benefits of project

Project definition and objectives (these can set the organization of all subsequent sections)

Background (much reduced, includes only minimal and relevant research material that directly supports need and value of this project)

Project Activities (steps taken that are relevant for later discussion of results, conclusions)

Tools, approaches, actions

Timeline (one-page Gantt chart in appendices if desired)

Cost of activities, if important

Project Results (data, test results, outcomes, etc. – *what you got*)

Discussion (analysis, interpretation, etc.; now combined with Results)

Conclusions (the “big picture” –the larger outcomes, the *significance* of what was done. Nothing here should come as a surprise, as you’ve set the scene for it in Results and Discussion.)

Recommendations (*what specific actions should be followed?* – further testing, next steps, suggestions for future senior projects, etc. Nothing here should come as a surprise, as you’ve set the scene for it in Results and Discussion.)

Acknowledgements (use equitable forms of address for everybody – Dr., Mr., Ms. – and spell correctly!)

References, only if needed (use APA or other required citation method; on separate page)

Appendices, only if needed (each one with a title; e.g., Appendix A: Sample Calculations) – These represent supplemental information not crucial to understanding the report.

The most important points here are: why do this project? (need and value); sufficient background to support need and why you did what you did; what you did (why and how); what were the results and what do they mean; big picture meaning and significance; and what specific actions should your reader / audience take as a result of you doing this project?