

## The Term Project for ISE 441

- **Purpose of Project:** To provide you with a personal experience in the investigation of a use of simulation, especially as it relates to your undergraduate studies. You will have to find a problem or a topic, define the boundaries of the issue (model of the system), create one or more simulation model(s), verify your model(s), validate your model(s), perform an analysis, obtain meaningful results, and finally, make observations or recommendation(s).
- **Finding the Problem:** It is your responsibility to determine the problem or the issue. You may work in groups of up to four people (more people in the group means work is expected). The problem must use simulation or relate directly to simulation. The choice of project is important so that the problem is real, large enough to be a challenge, suitable for use of simulation, yet not too large to handle in the allotted time. Finding a problem seems to be the most significant challenge in doing this term project. You will have a lot more fun with the project and it will be of greatest interest to you if you tackle something of direct personal or professional interest. For example, consider policy or strategic simulations if you have special interest in: environment, education, criminal justice, diversity, peace, agriculture, economic development, military combat, technology development, etc. If you have interest in operations, do a real-time simulation of one of the conveyors in the manufacturing lab. Perhaps you would like to build modeling templates for the furniture industry or perhaps for assembly. If you interests are in methodology, consider a project that combines optimization (like genetic algorithms) and simulation. Maybe your interest is specific to the life science and you want to do a biological simulation or simulate a the screening for lung cancer. There are a number of computer and communications problems that lend themselves to simulation like workflow, algorithm testing, operating systems, network reliability, etc.. Don't be afraid of doing something novel or creative. Look up past issues of the *Proceedings of the Winter Simulation Conference* ([www.wintersim.org](http://www.wintersim.org)) to get some idea of the breadth of simulation uses. Or you can do an application of simulation -- speak to me about your interest.
- **Project Grading and Due Dates:** You will be turning in a detailed project proposal and a final report (make copies for yourself and your contact -- I will keep what you turn in). Weights will be as follows:
  - **(10%) Detailed Proposal** (1 to 3 pages of text). Provide a project a title. Describe the problem you wish to address, why it is important, and why simulation is appropriate. Your proposal should be more than "here is what I'd like to do!" You should have read some literature, constructed some preliminary models, and gotten some early results. Finally state what you expect to achieve. Break your document into paragraphs and sections. Grade will be 100, 90, 80, 70, or 60. If I feel you have not made much of an effort

yet, you will be getting a low grade for this report. The goal of the preliminary report is to get you going and to give me a chance to help, if possible.

- **(90%)** Final report (8 to 10 pages long, not including the programs). Grading is as follows:
  - **(8%)** Content-- writing style, grammar, spelling
  - **(7%)** Organization--presentation, appearance
  - **(15%)** Difficulty--complexity of system, organization
  - **(50%)** Simulation Model development and Use
    1. Resourcefulness--creativity in the analysis and design, embellishments, animation
    2. Model construction
    3. Choice of input models, distribution fitting
    4. Verification
    5. Validation
    6. Analysis of results including statistical output analysis
    7. Optimization
    8. Sensitivity analysis
  - **(10%)** Findings and conclusions, supported from simulation
- **More on the Final Report:** This should be your best effort and be of top quality in appearance, organization, and content. You can follow the following outline for your report, although feel free to make appropriate modifications:.

*Project Title Page* (title, author, date)

*Executive Summary* (one page - what you did and what were your final results and conclusions)

### *I. Introduction*

- Background (say something about why you are interested in this problem and why it is important)
- Problem definition (what is the problem and why simulate)
- Statement of scope and objectives (what are the system boundaries and what do you need to accomplish)

### *II. Methods and analysis*

- Model Construction (use of entities, resources, modules, model, etc.)
- Choice of Input, distribution fitting (how did you get this input for the model?)
  - Data, Expert Opinion... How did you get your inputs
- Verification (why do you think your model is working correctly?)
- Validation (why does your model represent the "real world"?)

- Statistical Output Analysis (use of terminating or steady-state?)
  - Optquest, PAN
- Sensitivity Analysis (are your results robust?)
- Animation (what does it do and why did you do it?)

### *III. Results and Discuss*

- Results from simulation experiments (summarize your results numerically with tables, graphs, and charts -- include confidence intervals)
- Optimization (if applicable, write out optimization model including objective function, constraints, requirements)
- Discussion of results (what do the results mean?)

### *IV. Conclusions and Recommendations*

#### *Appendices*

- Detailed computations
- Arena model, programs, etc. (include a disk or submit on Wolfware containing your models, so I can execute them if there are questions)

Reports should be typed and secured in a binder that can stand some abuse. Charts, graphs, and drawings should follow good engineering practice. Use headings to divide and organize report. Employ graphs and tables to summarize and display results, but make sure each has appropriately defined scales, variables, and source.

One final point--the earlier you get started the better the results.

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