

**MFG 5312/SE 5347**  
**Strategic Design of Manufacturing Systems/System Engineering Processes**  
**Course Syllabus**

**Instructor:** Bill Tseng, Ph.D., CMfgE/Mr. Carlos Garcia  
**Office:** Room A-130 Engineering Annex/E-113  
**Email/Phone:** [btseng@utep.edu](mailto:btseng@utep.edu)/[747-7990](tel:747-7990); cagarciarosales@miners.utep.edu/747-6097  
**Office Hours:** M/W 4:30 – 5:30 pm  
**Time/Place:** M 6 pm – 8:50 pm, BUSN 329

**Text:** Andrew Kusiak, *Computational Intelligence in Design and Manufacturing*, Wiley 2000.

**TA:** Mr. Carlos Garcia  
**Office:** E-113  
**Email:** [cagarciarosales@miners.utep.edu](mailto:cagarciarosales@miners.utep.edu)  
**Office Hours:** M/W 4:30 – 5:30 pm

**Reference books:**

Concurrent Engineering: Automation, Tools and Techniques by Andrew Kusiak  
Systems Approach to Computer Integrated Design and Manufacturing by Nanua Singh  
Concurrent Engineering Fundamentals: Integrated Product and Process Optimization by Biren Prasad, Volume I

**Prerequisite:** Permission of instructor

**Objective:**

The course is to introduce concepts of integrated design and manufacturing. The emphasis is placed on the study and analysis of models, algorithms, and systems applicable to the system-life-cycle from the design of components, through manufacturing, to distribution. The design and management of manufacturing and service systems is paramount to this course.

**Course Contents:**

- Modern manufacturing
- Knowledge-based systems
- Data mining
- Process planning
- Production planning and scheduling
- Group technology
- Neural networks
- Layout of machines and facilities

**Midterm**

**Project Presentations**

**Final Exam**

**Course Grading Scheme:**

Homework 20%  
Midterm 20%  
Quizzes 10%  
Semester Project 25%

Final Exam 20%  
Classroom participation 5%

**Timelines:**

Proposal	Sept. 24 <sup>th</sup>
Proposal Presentation	Sept. 24 <sup>th</sup>
Final Presentation Begin	Dec. 3 <sup>rd</sup>
Final Report	Dec. 10 <sup>th</sup>
Final Exam	Dec. 10 <sup>th</sup>

**Project Grading Scheme:**

5% project proposal  
20% project presentation  
70% project content  
5% attendance of the final project presentations

**Homeworks:** Regular homeworks are due by 6:00 pm on the day indicated on the assignment. Some homeworks that may be due in more than one week.

**Quizzes:** Numerous quizzes will be given in preparation for exams. The quizzes will not be announced in class.

**Exams:** Two in-class exams (midterm and final) will be given. All exams and quizzes will be open book and open notes.

**Semester Project Guidelines**

**YOU MAY CHOOSE ONE OF THE FOLLOWING FIVE TYPES OF PROJECTS:**

**A. Application Project** (Teaming of 2 - 3 students is encouraged)

You need to describe the problem considered for your project and propose a model and/or solution approach for solving the problem. Ideally, the project should be based on an industrial application. For industrial projects the emphasis is normally given on the problem formulation and a model to be developed, as those might be relatively difficult to accomplish. The solution procedure for an industrial application project is likely to be an extension of one of the algorithms discussed in class or a combination of more than one algorithm. If you do not have industrial contacts, you may select for your project a problem from a journal (e.g., *Journal of Manufacturing Systems*, *IIE Transactions on Design and Manufacturing*, *International Journal of Production Research*, *Journal of Intelligent Manufacturing*), a magazine (e.g., *IE Solutions*, *Interfaces*) or a book (serf the web). In such case you will be expected to present a model (e.g., integer programming, neural network) of the problem and a solution procedure (e.g., heuristic, expert system). Writing computer codes (e.g., JAVA, C++, ASP) and using standard computer software (e.g., expert system shells, neural network software, and data mining software) to support the developments included in the project will be an asset. **Make attempt to consider numerous alternatives (e.g., three layouts of a manufacturing facility) while proposing solutions, show the benefits and pitfalls of each alternative, and use visual tools to demonstrate the results** (e.g., bar charts, virtual reality).

**B. Research Paper** (Teams of 2 - 3 students is encouraged, **highly recommended**)

You may choose a specific topic in the area of production, manufacturing, energy, systems engineering and explore it in greater detail. This type of a project should survey the existing literature, identify and summarize a research problem, present existing methods for solving the problem, and formulate a new solution approach.

**C. Technical Proposal** (Teams of 2 - 3 students is encouraged)

This project option involves preparing a proposal for a funding agency, e.g., Department of Commerce, Department of Defense, Company X. Each of you is likely to write numerous proposals in your professional career. In fact, most of non-routine tasks performed in any require proposal preparation. The project is then funded from an internal or external source.

Examples of websites of interest: nsf.gov, darpa.mil, nasa.gov, atp.nist.gov.

**D. Research Proposal** (Teams of 2 - 3 students is encouraged)

The research proposal option involves preparing a proposal to a funding agency, e.g., National Science Foundation, Defense Advance Project Agency. If you plan a research career, you are likely to write many proposal proposals. Examples of websites of interest: nsf.gov, darpa.mil, nasa.gov.

**E. Software Development Project** (Teams of 1 - 2 students)

The student(s) are responsible for the development of software for one of the algorithms discussed in class, e.g., grouping algorithm, machine layout algorithm, scheduling algorithm. The code should be written in a widely used programming language (e.g., JAVA, C, C++, Visual Basic, ASP.NET) with a user-friendly interface.

**SEMESTER PROJECT REQUIREMENTS**

The project prepared for this class can NOT be used to meet requirements of any other class. Each semester project (irrespective of the type) must demonstrate some usage of software or computer programming skills, e.g., layout software, neural network software, C programming, etc.

**SEMESTER PROJECT REPORT FORMAT**

The project report should be prepared on a word processor and should contain figures and tables that are necessary to make the report easy to read. Be concise in your writing and consult technical writing references as needed (see below). The document should be double-space throughout and should use a standard font (Times 12). The first page should include the title of the project, project type (A, B, C, D, or E), student name(s), course title, and the date. The title page should be followed by an abstract (executive summary). Include also a table of contents, a list of figures, and a list of tables. All references must be included at the end of the paper, followed by appendices, if any. All pages (with the exception of the title page) should be numbered.

**The body of each semester project report should include the sections outlined next.**

**A. Application Project**

1. Introduction
2. Problem definition
3. Project goals
4. Model formulation
5. Solution approach
6. Computational study
7. Conclusions

**B. Technical Proposal Project**

Requirements are determined by the selected funding agency.

**C. Research Paper**

1. Abstract (about one hundred word long)
2. Statement of the problem
3. Literature review
4. Existing models and solution approaches
5. Proposed model and/or solution approach
6. Examples

7. Conclusions

#### **D. Research Proposal**

Requirements are determined by the selected funding agency.

#### **E. Software Development Project**

1. Introduction
2. Algorithm description
3. User's manual
4. Example problems (2)
5. Computer code description

### **SEMESTER PROJECT PROPOSAL**

The purpose of your project proposal is to outline the topic proposed and to receive feedback from the instructor. The proposal should be brief (less than 3 page long). You may attempt to prepare your project proposal in the format a project report (e.g., application project, software development project).

**Each semester project proposal should contain a Gant chart of the proposed project activities prepared with MS Project.**

### **PROJECT STATUS REPORT**

Each project team (student) is to make a five-minute presentation in class to report on the project status.

### **REFERENCES ON TECHNICAL WRITING**

[1] Olsen, L.A. and Huckin, T.N., *Principles of Communication for Science and Technology*, McGraw-Hill Book Company, New York, 1983.

[2] Sherlock, J., *A Guide to Technical Communication*, Allyn and Bacon, Inc., Newton, MA, 1985.

#### **Project effort (time) estimate**

It is expected that each student will spend about 45 hours on a project. Industrial or service application projects may take longer.

#### **Project presentation time estimate**

Each project has to be presented in class. A project team will be given about 15 minutes to present the results.

#### **Project report submission requirements**

Each team (student) should submit the following items (one per project):

Hard copy of the project report should be dropped off at my office (E-113).

Project report folder containing the project report file, the Power Point presentation slides, and software developed (when applicable) needs to be emailed to [cglopezulloa@miners.utep.edu](mailto:cglopezulloa@miners.utep.edu). **Compress the folder with all files with Winzip before emailing.** Label the compressed folder with your last name and the file content, e.g., Smith\_5312\_Sem\_Project. Reference your email accordingly, e.g., RE: Smith\_5312\_Sem\_Project.