

1. Department, number, and title of course: IE 330, Furniture Product Engineering, (credit 3, required course for BSIE, Furniture Manufacturing degree track)

2. Course (catalog) description: Introduction to use and properties of materials and construction methods used in mass production of furniture. Examines techniques of product engineering and its role in determining product quality and manufacturability. Emphasis on principles of computer-based product development, specification, and performance evaluation.

3. Prerequisite: IE 210, Introductory Engineering Graphics for Industrial Engineers

4. Textbook(s) and/or other required material: Rudolf Willard, *Furniture Construction*, North Carolina State University, 1982.

5. Course objectives: By the end of the course the students will be able to:

- a. Select appropriate furniture materials for varying design constructions
- b. Predict material behavior in response to changes in atmospheric conditions
- c. Design and/or select suitable furniture joinery for a given application
- d. Create parametric solid computer models of furniture components and assemblies
- e. Compute part blank sizes, including machining allowances
- f. Estimate material costs, including scrap allowances

6. Topics covered (number of classes):

- a. Introduction to Product Engineering (1)
- b. Furniture Materials (2)
- c. Furniture Joints (4)
- d. Construction of Casegoods (4)
- e. Chair construction (1)
- f. Upholstery construction (2)
- g. 32mm construction (1)
- h. CAD - Parametric modeling (4)
- i. CAD – Drafting (3)
- j. CAD – Assemblies (3)
- k. Bills of materials and veneer bills (4)

7. Class schedule, i.e. number of sessions each week and duration of each session:

Two days per week, 75 minutes per session

8. Contribution of course to meeting the professional component: 3 credit hours of engineering topics (1 credit hour of engineering science, 2 credit hours of engineering design). This course is the first course in a four-course furniture manufacturing sequence. Teams of 2-3 students are assigned a furniture product engineering project using artistic furniture designs provided by industry. Each team is responsible for deciding which material(s) to use, designing the joinery, and ensuring that the item(s) will fit together despite the shrinkage and swelling that is normal for wood materials. They create fully parametric CAD solid models of their designs, and they compute material requirements that factor in typical machining allowances used in industry.

9. Relationship of course to program outcomes (Criterion 3):

N/A = not applicable, minor, moderate, or major contribution of course to Criterion 3 outcomes a-k

| Outcome | Contribution | Course content related to outcome |
|---|---------------------|--|
| a. Math, science, engineering | Moderate | Students apply basic engineering formulas while modeling component relationships in the parametric CAD system. Computation of wood shrinkage and swelling in response to atmospheric changes involves plant science. |
| b. Design, conduct experiments | N/A | |
| c. Design system, component, process | Major | The semester project requires students to convert artistic impressions of furniture into fully detailed engineering models. This involves material selection and the design of joinery. |
| d. Multi-disciplinary teams | Moderate | Students from the Department of Industrial Design often take this course for a minor in Furniture Manufacturing. This provides direct interaction between designers and engineers. |
| e. Engineering problems | Moderate | Students consider wood shrinkage and swelling and then design wood joints that provide the necessary room for movement. They formulate geometric relationships between mating parts. |
| f. Professional; ethics | Minor | Lectures are sprinkled with "real world" lessons on how to interact productively with shop floor employees with whom the students will likely supervise. Other issues such as environmentally responsible use of materials are also covered. |
| g. Communicate | Moderate | The semester projects require communication in many forms between students and the instructor. |
| h. Impact of engineering solutions | Minor | The semester project includes analysis' in which students predict wood shrinkage and swelling, and then conduct checks to verify that components will not interfere with one another. |
| i. Life-long learning | Minor | Guest lectures are provided by Industrial Extension Specialists, thus exposing students to resources that will available to them in industry. |
| j. Contemporary issues | Moderate | Students are exposed to environmentally conscious material selection, low VOC finishing materials/methods, etc. |
| k. Modern engineering tools | Major | Students are using the latest computer-aided design and engineering software to model and analyze their furniture designs. |

Relationship of course to program criteria (Criterion 8):

The course contributes to the program criteria by addressing:

- a. How furniture product engineers interact with other divisions within a company, such as design, marketing, purchasing, IT, etc.
- b. Professional practice issues such as engineering communications in both written and graphical forms.
- c. Other professional practices such as cost analysis.

10. **Person(s) who prepared this description and date of preparation:** Denis Cormier, Draft in April 2002; Updated in September 2003.