

EXECUTING THE CBE 459 DESIGN PROJECT

In an effort to help you organize the work on your design projects, several recommendations have been prepared which, hopefully, you will find beneficial:

- (1) Keep all of the CBE 400 materials in a looseleaf binder for easy access.
- (2) Prepare a looseleaf binder to contain materials relating to your design, including:
 - a. Important references
 - b. Design calculations
 - c. Computer programs and results

Bring the binder to your Tuesday design meetings.

- (3) For the first design meeting in January, be prepared to present your *project charter* in writing, as described in Section 2.2 of SSLW. Also, show your initial work on an *innovation map* for your product design (see Section 1.3, SSLW). In addition, show the initial results of your market and competitive analyses and indicate customer requirements (see Section 2.4, SSLW).

Then, when a process is being designed, discuss your findings, thus far, concerning:

- a. A survey of the methods used in manufacturing the product, giving the raw materials, the principal chemical reactions, byproducts, and intermediates.
- b. A discussion of the choice of the production level and plant location.
- c. Create a block diagram showing the principal steps for the process anticipated to be the most promising (SSLW – p102). When possible, prepare promising process flow diagrams (SSLW – pp102-104)
- c. Reaction kinetics and thermophysical property data (Section 4.2 - SSLW)
- d. Economics, toxicity, and safety data (Sections 1.4, 1.5, and 4.2 - SSLW)

Where you are uncertain or have questions, seek the advice of your faculty advisor and industrial consultants.

These materials should be updated and presented every Tuesday, with one copy provided for your faculty advisor, Professor Fabiano, and the industrial consultant(s) who will be meeting with you.

- (4) Learn to use the Towne and Chemistry Libraries effectively. To help, our librarians, Douglas McGee and Judith Currano, have prepared a discussion of the special features of the Towne and Chemistry Libraries, use of the important indices, computerized databases, and facilities for interlibrary loans. Plan on attending his talk from 5:00-6:30 p.m. on Wednesday, January 11 (room to be announced). See also *Literature Survey* in Section 1.3 (SSLW – pp10-12).

- (5) As your design evolves, individual team members should assume responsibility for aspects of the work. It is important that your group meet from time-to-time during the week to examine each other's work and coordinate the next steps. See *Preparation of the Written Report* in Section 26.1 (SSLW – 687-689).
- (6) At Tuesday meetings, each student in the group should be prepared to discuss aspects of the work for which he or she is responsible. Use the meetings to discuss results and seek advice. Participation here will influence your grade.
- (7) Between Tuesday design meetings, you can seek help from your advisor, other faculty with specific expertise, the industrial consultants, local industry, etc. Professor Fabiano will be available for sessions by appointment on Thursdays or Fridays and selected evenings by appointment (see Meghan Godfrey in the CBE Office.) Our industrial consultants all have busy schedules. Please contact them only after exhausting other avenues for help. When contacting persons in industry, be sure they understand that your questions concern your senior design project.
- (8) Your preliminary designs should be completed by the end of January. For a process, plan to submit a preliminary material balance and a computer-drawn block flow diagram by the first week of February. For a product, focus on the critical-to-quality (CTQ) variables, the superior product concept, a competitive (patent) analysis, and other important considerations. These materials will be graded by Professor Fabiano.
- (9) Most of the process synthesis work should be completed by the last week of February. Plan to submit the material and energy balances for the most promising flowsheet(s), that is, base-case designs, together with a computer-drawn process flow diagram. See *Flow Diagrams* in Section 4.5 (pp102-104). These materials will be graded by Professor Fabiano.
- (10) Much of the detailed design of your new product and/or the process units for your manufacturing plant should be completed by the last week in March. Plan to submit the detailed design for your product and/or one key process unit. These materials will be graded by Professor Fabiano.
- (11) You will complete two survey questionnaires during the semester in which each design team member will be asked to assess the percentage effort on the project by all team members including himself/herself.
- (12) Feel free to use Aspen Tech's Aspen Engineering Suite (including ASPEN PLUS, SPLIT, ASPEN PLUS DYNAMICS, ASPEN BATCH PROCESS DEVELOPER (formerly BATCH PLUS), and ASPEN PROCESS ECONOMIC ANALYZER (formerly Aspen IPE), SUPERPRO DESIGNER, the Downey Economics Spreadsheet (Profitability Analysis 2.0.xls), VISIO Technical Plus, MATLAB, and GAMS. These programs can be accessed from the PC's in the Towne computer labs. Use of the computer is optional throughout the course.
- (13) Your written design report is due on Tuesday, April 3. It should follow the format in Chapter 26 (*Written Reports and Oral Presentations* – SSLW). The report will be

reviewed by your advisor and returned to you with comments before Friday, April 6. You will make revisions and submit your revised written report on Tuesday, April 10. Note that a lecture has been scheduled on Tuesday, February 14, from 6:00-7:00 p.m., to provide advice in the preparation of your design report. All students should plan to attend. Also, the design reports will be bound for storage in the Towne Library.

- (14) Oral design presentations will be on Tuesday, April 17. Each group will be allotted 35 min (30 min presentation, 5 min questions). We will have an **All-day Technical Meeting** involving students, faculty, and consultants. A luncheon will be held. The **Senior Class Picture** will be taken just prior to the luncheon.
- (15) As an option, each design group may prepare a poster, summarizing the highlights of its design, for display outside of the Chemical and Biomolecular Engineering Office. The posters must be completed by Friday, April 27, and deposited in the Chemical and Biomolecular Engineering Office.
- (16) The winners of the Melvin C. Molstad Prize, for the most outstanding design, will be honored during Commencement Exercises.
- (17) The three best designs will be selected to compete in the Engineering Alumni Board Competition on Friday, April 27. The three groups will be notified by Friday, April 20. Each group will be allotted 15 min (12 min presentation, 3 min questions).

This year's projects are very promising and, hopefully, will lead to novel and profitable designs. Good Luck!