

SUMMARY REPORT

CHEMICAL ENGINEERING ELECTIVES

A Mini-session Presented at the  
Annual Meeting

American Institute of Chemical Engineers  
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## INTRODUCTION

In 1971, the Chemical Engineering Education Projects Committee conducted a survey on the teaching of Mass and Energy Balances in the chemical engineering curricula of about 150 universities in the United States and Canada. The purpose was to compile data on texts, laboratories, academic level and course content, and to discover and share innovative teaching techniques. Each succeeding year, a different chemical engineering subject area has been surveyed. From a modest 59 replies in 1971, the response has increased to a record 120 replies in last year's survey on Plant Design. Ninety replies were received to this year's survey on Chemical Engineering Electives.

The survey is conducted by means of a questionnaire mailed to the department chairman at 161 universities in the United States and Canada in late April. A follow-up letter is sent in early August to those departments which have not responded. Results are reported and discussed at the Undergraduate Free Forum at the AIChE Annual Meeting. A written summary of the survey is sent to each department submitting a completed questionnaire. A copy of the questionnaire is attached to this report.

Surveys in previous years have sought to uncover novel teaching techniques and unusual approaches in each of the subject areas. Because of the wide variety of elective courses, such an approach has not been possible in this survey.

This year's survey suffered from a typographical error which created undue confusion in completing the questionnaire. While the cover letter clearly indicated that elective courses were being surveyed, the title on the questionnaire itself read "Questionnaire on the Teaching of Undergraduate Plant Design." Some respondents were not sure how electives were related to plant design. Of course, there is no relationship.

### CRITERIA FOR COURSES

Most university catalogs include more courses than are taught regularly. In order to have the questionnaire reflect current teaching practices, the following criteria were set for including courses in the questionnaire.

1. The course must be listed in the college catalog as a chemical engineering department course.
2. The course must have been taught during 1978-79 and/or 1979-80 academic years.
3. The course could have been taught by adjunct faculty or lecturers from industry as well as by full-time faculty.

The second restriction eliminates a few courses taught less frequently than every two years. For the most part, however, the restriction eliminates courses which are never taught but which have not been deleted from the catalog.

## CLASSIFICATION OF ELECTIVES

Respondents were asked to classify the electives into one of 16 categories plus "others". The latter classification initially contained 26.9% of the courses. Closer examination of this category showed 35 courses in polymer related courses. These were then placed among the other categories.

	<u>Number of Courses</u>	<u>PerCent of All Courses</u>
Other	135	21.33
Environmental Science	65	10.27
Design	55	8.69
Mathematics	51	8.06
Process Dynamics	42	6.64
Polymer Science	35	5.53
Chemistry	33	5.21
Unit Operations	27	4.27
Biochemistry	26	4.11
Fluid Flow	24	3.79
Heat Transfer	22	3.48
Mass Transfer	22	3.48
Biomedical Engineering	20	3.16
Economics	20	3.16
Thermodynamics	16	2.53
Kinetics	16	2.53
Nuclear Engineering	15	2.37
Stoichiometry	9	1.42

A number of courses in the category "Other" were catch-all courses such as "Special Problems," "Special Topics," "Independent Work," and "Research" whose content would vary from year to year. Some areas covered in courses listed under "Other" include the following:

- Corrosion
- Electrochemical Engineering
- Petroleum Processing
- Transport Phenomena
- Energy Sources
- Industrial Methods
- Project Engineering in Industry

A few of the more intriguing electives were the following:

- Physiological Instrumentation
- Technical Administration
- Food Engineering I, II
- Engineering in a Legal Environment
- Inventive Reasoning
- Man and His Environment
- The Chemical Engineer as an Entrepreneur

#### LEVEL OF ELECTIVES

Chemical engineering electives are offered primarily during the senior year.

The following tables treat schools on the semester system as one group and schools on the quarter system as a second group.

Semester system

Junior, first semester	16.0%
Junior, second semester	12.4%
Senior, first semester	33.1%
Senior, second semester	38.5%

Quarter system

Junior, first quarter	4.5%
Junior, second quarter	6.0%
Junior, third quarter	3.7%
Senior, first quarter	28.4%
Senior, second quarter	28.4%
Senior, third quarter	26.0%

TOTAL CURRICULUM HOURS

Respondents reported the total hours in the chemical engineering curriculum. The average for all curricula reporting was 133.

<u>TOTAL HOURS</u>	<u>NO. OF SCHOOLS</u>
127 or less	6
128 - 129	6
130 - 131	6
132 - 133	7
134 - 135	7
136 - 137	9
138 - 139	3
140 +	4

ELECTIVE HOURS

Respondents were asked to indicate the number of elective hours in their curricula. Five schools indicated no electives. One third of the schools have 3 or fewer elective courses.

<u>Hours</u>	<u>No. of Schools</u>
0	5
1 - 9	25
10 - 15	22
16 - 21	13
22 - 27	1
28 - 33	1
34 +	6

QUESTIONNAIRE ON TEACHING OF  
UNDERGRADUATE PLANT DESIGN

Instructor \_\_\_\_\_

University \_\_\_\_\_

<u>Course ID</u>	<u>Catalog No.</u>	<u>Course Title</u>	<u>HRS/WEEK</u>		<u>Credit</u>	<u>Class Size</u>	<u>Classifi- cation</u>
			<u>Lec.</u>	<u>Lab.</u>			
1	_____	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____	_____

CLASSIFICATION CODES

- |                     |                            |
|---------------------|----------------------------|
| 1. Stoichiometry    | 10. Mathematics            |
| 2. Mass Transfer    | 11. Chemistry              |
| 3. Fluid Flow       | 12. Biochemistry           |
| 4. Heat Transfer    | 13. Environmental Science  |
| 5. Thermodynamics   | 14. Bromedical Engineering |
| 6. Kinetics         | 15. Economics              |
| 7. Unit Operations  | 16. Nuclear Engineering    |
| 8. Design           |                            |
| 9. Process Dynamics | 20. Other                  |

Please complete other side



Course ID	Course Level		Check one in each group. or quarter			Indicate weeks per semester		
	Jr.	Sr.	1st	2nd	3rd	Semester	Quarter	Weeks
1	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—

Course ID	Text(s)	(Author/Title)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

How many hours of electives (excluding options) does your curriculum permit? \_\_\_\_\_

Total hours in ChE curriculum \_\_\_\_\_

Please complete other side