

THE TEACHING OF UNDERGRADUATE
KINETICS / REACTOR DESIGN

A Survey Prepared by the
Chemical Engineering Education Projects Committee

I COURSE MECHANICS

factors. These include student enrollments and the time allocated to the course.

Course Length.

About 22% of the departments responding operate on the

quarter system. The quarter lasts just over 10 weeks while the semester is less than 15 weeks long. Both time periods exclude final examinations.

COURSE LENGTH
(Quarter Basis)

COURSE LENGTH
(Semester Basis)

Length Departments

Length Departments

Course Level.

The Kinetics/Reactor Design course is usually taught at the senior level. Within in the senior year, there is a [redacted] the first semester and the second quarter

(Semester Basis)

<u>Semester</u>	<u>Courses</u>
Junior, Semester 1	11
Junior, Semester 2	22
Senior, Semester 1	50
Senior, Semester 2	5

(Quarter Basis)

<u>Quarter</u>	<u>Courses</u>
Junior, Quarter 1	2
Junior, Quarter 2	1
Junior, Quarter 3	3
Senior, Quarter 1	15
Senior, Quarter 2	3

Class Sessions.

In 79% of the departments, the course meets for three hours lecture per week. In 14% there are two hours per

LECTURE HOURS PER WEEK

(Based on 50-minute periods)

<u>Hours</u>	<u>Departments</u>
1	3
2	5
3	81
4	14
Average	3.42

LABORATORY HOURS PER WEEK
(Based on 50-minute periods)

<u>Hours</u>	<u>Departments</u>
0	78*
1	9
2	7
3	5
4	1
Average	1.91

*excluded from average

Class Sections and Enrollment.

81% of the departments offer one section of Kinetics/Reactor Design annually. 19% offer two sections. 38% of the sections have enrollments of 20 to 40 students

NUMBER OF SECTIONS
(1990-91)

<u>Sections</u>	<u>Departments</u>
1	83
2	20
3	1
4	1

COURSE ENROLLMENT
(1990-91)

<u>Enrollment</u>	<u>Courses</u>
1 - 10	10
11 - 20	26
21 - 40	40
41 - 60	13
60 -100	9
100+	3

enrolled in kinetics/Reactor Design

Computer Preparation.

Three questions in the questionnaire dealt with the

computer skills of the students. About three-quarters of

the departments offer a course in computers, usually in the freshman year. This usually includes a high level programming language such as FORTRAN or BASIC.

What computer languages/programs do students use in this course?

	<u>Departments</u>
FORTRAN	71
Lotus	36
Basic	30
Pascal	5
Flowtran	4
Other	

III. COURSE CONTENT

This section deals with several aspects of the course content. These include textbook selection, problem solving and design content.

Textbook.

In almost every survey conducted over the past 20 years, one textbook is used in a majority of the courses. This survey was no exception. The text by Fogler was used in 53 courses. Four other texts were mentioned. The usage by chapters for Fogler is given below.

TEXTBOOKS

Fogler, H. Scott: Elements of Chemical Reaction Engineering, 2nd ed., Prentice-Hall, New Jersey, 1992.

CHAPTERS COVERED IN FOGLER

<u>Chapter</u>	<u>Courses</u>	<u>Chapter</u>	<u>Courses</u>
1	53	9	40
2	53	10	27
3	53	11	31
4	53	12	7
5	51	13	17
6	45	14	14
7	34	15	1
8	53	16	0

STRENGTHS AND WEAKNESSES OF THE TEXTBOOK

Strengths:

Clarity
Example problems
Realistic
Comprehensive
Computer Problems

Weaknesses:

Needs more numerical methods

Some topics for inclusion in future textbooks were mentioned by several respondees.

ADDITIONAL TEXTBOOK TOPICS

Case Studies
Economics
Multi Steady State Dynamics
Reactor Safety Conditions

Most departments (76%) require their students to use the computer in solving assignments in this course. Most courses (71%) utilize the computer for 10% to 30% of the assignments. PC ownership is increasing among chemical engineering students. 65% of the departments report that 10% to 30% of their students own PC's.

Do you encourage students to use the computer in their homework assignments?

	<u>Departments</u>
Yes	80
No	25

What percent of assignments were done with the computer?

<u>Percent</u>	<u>Departments</u>
0	7
10	33
20	23
30	17
40	5
50+	18

What percent of the students own a PC?

	<u>Departments</u>
10	29
20	20
30	18
40	6
50+	17

The English system is more widely used than the SI system in solving problems. Many departments (75%) would like to use the SI system over 50% of the time.

What percent of the problems you assign are solved in the SI system?

<u>Percent</u>	<u>Departments</u>
0	13
10	29
20	20
30	18
40	6
50+	17

What percent of the problems would you like to see solved in the SI system?

<u>Percent</u>	<u>Departments</u>
0	20
10	3
20	2
30	4
40	0
50+	80

The inclusion of design in the Kinetic/Reactor Design course was examined through the next three questions. Most departments (59%) would use design problems occasionally if present in the text. 33% assign projects lasting one month or longer. 20% of the departments claim no ABET design

Do you assign a project lasting one month or longer in this course?

	<u>Departments</u>
Yes	34
No	68

How many ABET design credits do you assign to this course?

<u>Credits</u>	<u>Departments</u>
0.0	22
0.5	18
1.0	36
1.5	14
2.0	16
<u>3.0</u>	6

