TO: Faculty of the Schools of Engineering

FROM: Faculty of the School of Chemical Engineering

SUBJECT: New Graduate Level Course

The Faculty of the School of Chemical Engineering has approved the following new course effective Fall 1996. Approval of the Faculty of the Schools of Engineering is requested for ChE 685.

CHE 685, EDUCATIONAL METHODS IN ENGINEERING

A. COURSE DESCRIPTION

Semester 1 or 2, Class 3, Lab 0, Credit 3
Prerequisite: Admitted into Ph.D. program in a technical area.

Classroom techniques: lecture, discussion, cooperative groups, mastery and PSI, TV and video, computer, field trips, seminar classes, and guided design. Teaching laboratory and design courses. Preparing for class: goals, objectives, syllabus, discipline, and ABET accreditation. Homework, projects, testing and grading. Evaluation of teaching and teaching improvement. Students: Myers-Briggs type, student development theories, motivation, learning theories and learning cycles. Professional concerns: time management and efficiency, ethics, obtaining an academic position, promotion and tenure. Practice teaching and visits to other classrooms. Group projects will involve development of graduate and undergraduate engineering programs.

B. REASON

The purpose of this course is to teach students how to teach in an engineering school. The assumption is made that engineering professors will do both teaching and research. The course is based on the premise that new professors will do a better job in their first teaching assignments if they receive an education in how-to-teach while they are Ph.D. students. Anecdotal evidence supports this premise and shows that this course has helped some former students obtain their first academic position.

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE COMMITTEE ON
FACULTY RELATIONS

CFR [illegible] 864

Date 11/25/96

Chairman R. Neal Houze

G. V. Reklaitis, Head
School of Chemical Engineering

SUPPORTING DOCUMENTATION

1. **Justification:**
With increasing pressure on professors to do an excellent job in both teaching and research it becomes important to teach Ph.D. students both how to do research and how to teach. This is easiest to do in a disciplinary atmosphere by a professor who teaches a very similar subject. The initial model for this course was PSY 695/EDPS 634. Unfortunately, PSY 695/EDPS 634 does not include engineering design and laboratory, is often full, and requires considerable translation of content into engineering. Very few engineering students ever sign up for PSY 695/EDPS 634 even though it has been advertised. This new course has been successfully taught as CHE 697W and has been well received. The course was initially taught in 1983 as a two credit course for chemical engineers only and during the six times it was taught has gradually evolved to its present form. Experience has shown that teaching in the different disciplines of engineering is similar enough that students from different areas have little difficulty working and learning from each other. In this class on teaching engineers, the focus is on engineering-related topics. For example, problem solving, technical oral presentations, personality types of engineering students, computer simulations, writing problem-oriented exams, incorporating design throughout the curriculum, and the highly hierarchical structure of engineering knowledge and of the engineering curriculum. The development of the course was partially supported by an NSF grant. Approximately half a dozen similar courses have been started at Engineering schools throughout the US since the development of this course and the associated textbook. In both spring 1991 and spring 1994, 14 students were enrolled in the course for credit.

2. **Level:** 600 level meant for Ph.D. students who are considering academic careers.

3. **Prerequisites:** Admitted into Ph.D. program in a technical area.

4. **Course Instructors:** Dr. F. S. Oreovicz and Dr. P. C. Wankat

5. Course Outline:

Class	Topic	Chapter
	PART I: METHODS AND PROCEDURES	
1	Housekeeping and Introduction	1
2	What Works & First course	3
3	Efficiency	2
	HOLIDAY - MARTIN LUTHER KING DAY	
4	Academic Jobs Appx. A	
5	Communication Skills I	
6	Taxonomy & Objectives	4
7	ABET & Textbooks	4
8	Problem Solving 5	
9	Lecture	5
10	Questions and Discussion	6/7
11	Cooperative Groups 7	
12	Mastery and PSI 7	
13	TV and Video - Field Trip	8
14	Computer - Field Trip	8
15	Advising and Tutoring	Sections 10.1 to 10.3
16	Testing	11
17	Testing and Grading 11	
18	Cheating/Discipline 12	
19	Evaluation of Teaching	16
20	Professional Concerns & Ethics	17
21	Catch-Up & Review	
22	Examination	
23	Review Exam	
	PART II: STUDENTS - TYPES, DEVELOPMENT AND LEARNING	
24	Myers-Briggs	13
25	Myers-Briggs	13
26	Piaget	14
27	Perry	14
28	Perry	14
29	Learning Theories	15
30	Learning Theories	15
31	Motivation	15
32	Designing a Class to Use Theories	
	PART III. REDESIGN - THE IDEAL TEACHING/LEARNING SYSTEM	
33	Guided Design - Ideal Graduate Program - I	pp. 175-178
34	Guided Design - II	(Section 10.4)
35	Guided Design - III	CEE paper
36	Group Work: Near-Ideal Undergraduate Program	
37	Group Work: Near-Ideal Undergraduate Program	
38	Group Work: Near-Ideal Undergraduate Program	
39	Group Work: Near-Ideal Undergraduate Program	
40	Group Work: Near-Ideal Undergraduate Program	
41	Group Work: Near-Ideal Undergraduate Program	
42	Group Work: Near-Ideal Undergraduate Program	
43	Communication Skills - II	
44	Group Reports - Group Written Project Due	
Finals - Group Oral Reports		

6. Text:

Wankat, P.C. and Oreovicz, F. S., "Teaching Engineering", McGraw-Hill, New York, 1993.

Wankat, P.C., "Learning Through Doing. A Course on Writing a Textbook Chapter", Chemical Engineering Education, 208-211 (Fall 1993).