

TO: Faculty of the Schools of Engineering
FROM: Faculty of the School of Chemical Engineering
SUBJECT: New Undergraduate and Graduate Level Course

The Faculty of the School of Chemical Engineering has approved the following new course effective Fall 1997. Approval of the Faculty of the Schools of Engineering is requested for ChE 557.

CHE 557. INTELLIGENT SYSTEMS IN PROCESS ENGINEERING

A. COURSE DESCRIPTION

Semester 2, Class 3, Lab 0, Credit 3
Prerequisite: Senior standing or Consent of the Instructor

Introduction to artificial intelligence concepts and techniques and their application to important problems in chemical process systems engineering. Topics covered include: introduction to artificial intelligence, knowledge representation and search, knowledge-based systems, neural networks, genetic algorithms, inexact reasoning techniques, industrial case studies in process fault diagnosis and control, design and synthesis, planning and scheduling, AI languages, tools, and environments.

B. REASON

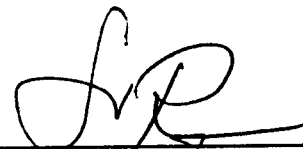
The intelligent systems framework has emerged as one of the important modern approaches to computer-assisted problem-solving in process systems engineering. ChE 557 will introduce this approach from the chemical process systems engineering perspective. This course will bring state-of-the-art tools and techniques and industrial case studies to the classroom to educate and prepare undergraduate and graduate students in current trends in solving problems in process systems engineering.

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

CFR Minutes 564

Date 11/25/96

Chairman CFR R. Neal Houze



G. V. Reklaitis, Head
School of Chemical Engineering

SUPPORTING DOCUMENTATION

1. **Justification**

Artificial Intelligence has emerged as one of the important modern tools for automated problem-solving in engineering. Over the past ten years we have witnessed a broadly-based and intense effort to bring ideas, methodologies and tools from artificial intelligence into the scope of process systems engineering problems. This dual-level course has been developed with the aim to introduce the concepts and techniques in the design of intelligent systems for process engineering problems to chemical engineering students. A course on this subject taught from a chemical engineering perspective is essential as courses of similar nature offered in computer science and/or electrical engineering departments do not emphasize the process systems engineering context which chemical engineering students need in order to develop a proper appreciation of the AI approach to their problems. This course has been offered six times since Spring 1989 as ChE 597V with an average attendance of about 16 students, typically 70% are undergraduates and the rest grad students. A limit on enrollment (25) has been imposed because of limited availability of engineering workstations needed for project assignments in the course.

2. **Level:** This course is intended to be a dual-level course.

3. **Prerequisites:** Senior standing or Permission of the Instructor

4. **Course Instructor:** Professor Venkat Venkatasubramanian

5. **Course Outline:**

<u>Topics</u>	<u># of Lectures</u>
a. Introduction to AI and Lisp	6
b. Overview of Search and Knowledge Representation	6
c. Knowledge-based Expert Systems	3
d. Inexact reasoning: Bayesian, Fuzzy Logic	4
e. Neural Networks	4
f. Genetic Algorithms	4
g. Industrial Case Studies in Process Fault Diagnosis and Control	6
h. Industrial Case Studies in Process and Product Design	6
i. Industrial Case Studies in Scheduling and Planning of Process Operations	6

6. **Text:**
Artificial Intelligence in Chemical Engineering by
Thomas E. Quantrille and Y. A. Liu, Academic Press, 1991.

LISP by Winston and Horn, Addison-Wesley, 1991.

Lecture notes based on selected papers and industrial case studies

