

The University Senate of Michigan Technological University

PROPOSAL 13-96

ASSOCIATE IN APPLIED SCIENCE DEGREE IN CHEMICAL ENGINEERING TECHNOLOGY

The requirements to initiate the degree are described in the following text.

Introduction

The use of chemistry in value-added manufacturing processes describes a variety of industries that are collectively known as "chemical process industries (CPI)." Technological changes and concern for the environment and safety have brought a high degree of sophistication to the CPI. Concurrently with these changes and concerns has been the requirement for greatly increase skills in the work-force associated with the manufacturing process.

Although the CPI work-force includes maintenance workers, instrument technicians, and engineers there are few positions more important or more responsible than those individuals responsible for process operations; the chemical process operator. These operators are frequently responsible for managing multimillion dollar facilities involving chemicals and materials which are often hazardous and toxic. Their skills must be high in working with sophisticated instrumentation, in adapting to operational changes, in understanding environmental and regulatory constraints, and in focusing on process safety throughout their responsibilities.

Michigan Technological University is well positioned to offer an Associate Degree in Chemical Engineering Technology which will meet the needs of industry in advanced process operations. The Department of Chemical Engineering houses an outstanding Unit Operations Laboratory with world-class pilot plant facilities in the Process Simulation and Control Center and the School of Technology has a history of successfully educating engineering technicians. Working together the Department of Chemical Engineering and the School of Technology can educate CPI technical workers in an environment not duplicated elsewhere and meet an expressed industrial need for chemical process technicians.

Degree Proposal

The School of Technology proposes to offer an associate degree in Chemical Engineering Technology with the cooperation of the Department of Chemical Engineering on the Michigan Tech campus. This degree program is designed to meet the need of industrial partners such as The Dow Chemical Company and The Dow Corning Corporation, as well as, industries dealing with the chemical processing of pharmaceuticals, food, refining and many other chemical processing manufacturers. The need for chemical engineering technicians is well documented in the literature and is the subject of intense study by the American Chemical Society and many collaborating organizations. Articles in the Wall Street Journal, Fortune Magazine and other sources document the demand for chemical engineering technicians and the lack of qualified individuals to meet the needs of industry. The National Science Foundation, through it's Advanced Technological Education program, is funding the development and implementation of this curriculum in the amount of \$500,000 over a period of three years with the possibility of two additional years of funding for program evaluation and dissemination.

Concurrent with the implementation of the MTU associate degree in Chemical Engineering Technology on the Michigan Tech campus will be the development of a chemical engineering technology transfer program at Delta College. Delta's program will prepare students in the greater Saginaw Valley area for college level classes and will then offer the first year of the two year associate degree program. Internship opportunities for appropriate students will be made available by The Dow Chemical Company and The

Dow Corning Corporation who are corporate partners in the development of this collaborative degree program. Students who successfully complete the first year curriculum at Delta will transfer to Michigan Tech for the second and final year to complete their degree program. The National Science Foundation through its Advanced Technological Education program have funded the development and implementation of this collaborative degree program in the amount of \$499,996 over three years with the possibility of two additional years of funding for program evaluation and for transfer of the curriculum to other academic institutions in other regions of the country.

Program Administration

The program and its faculty will be administratively housed in the School of Technology. Faculty in this program would be considered for promotion and tenure under the promotion and tenure criteria approved for use in the School of Technology.

Curriculum

The Chemical Engineering Technology curriculum will draw on currently existing courses in the School of Technology and the Colleges of Engineering and Sciences and Arts. New courses pertaining to Chemical Engineering Technology are proposed. Laboratory classes will be held in labs in the Department of Chemical Engineering with the Department's cooperation.

Faculty

This program will require two new faculty with education and experience in chemical engineering. Important faculty credentials are a masters degree, or higher, in chemical engineering and at least three years of experience in a chemical processing industry. It is expected that salaries for these individuals will be below the average salary of a faculty member in the College of Engineering.

Teaching assistance in the Chemical Engineering Technology program may be drawn from graduate students in the Department of Chemical Engineering's graduate program.

Chemical Engineering Technology Programs in the State and Nation

Chemical Engineering Technology programs which are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC-ABET) are found at the following colleges. Although these programs are accredited, they provide no experience in process operations and have no pilot plant facilities for use as a capstone experience. The only other program which addresses the area of chemical process operations is located at Brazosport College in Lake Jackson, TX. Brazosport College has a very successful program that addresses the pressing need for operators in that heavily industrial area of the South.

TAC/ABET accredited programs are located at:

- 1) Broome Community College, Binghamton, NY
- 2) Memphis State Technical Institute, Memphis, TN
- 3) Naugatuck Valley Community - Technical College, Waterbury, CT
- 4) Three Rivers Community - Technical College Thames Campus, Norwich, CT
- 5) Trident Technical College, Charleston, SC

The chemical processing industries are not well served by chemical engineering technology programs for several reasons. First, technological changes have only recently made it desirable to hire individuals with specific education in chemical processing. These individuals understand computers, sensors, statistical process control, chemistry and other related subjects. Second, while chemistry technology programs can be found more frequently, it is very difficult for a college to provide the laboratory experience needed for a chemical "engineering" technology program of study. This is not a problem at Michigan Tech due to the availability of the new pilot plant facilities in the Unit Operations laboratory of the Department of Chemical Engineering.

Source of Students

It is expected that students will be attracted to this degree program from several sources. First, the

partnership with Delta College is expressly developed to be a feeder program into the second year for the MTU associate degree program. Delta College serves a diverse population of students in the greater Saginaw Valley area. Through its articulation agreements with area high schools, Delta is well placed to introduce advanced process operations and opportunities in chemical and other related engineering disciplines to students they already serve. Thus, a new pipeline for a more diverse student population in some of the engineering and engineering technology curricula will be opened. We expect that students entering the Delta program will receive any preparatory work they need to handle college level math, English and science and be ready to step into the MTU program on successful completion of the first year at Delta. Under the NSF grant, Michigan Tech faculty will be directly involved in curriculum review and student / program evaluation to ensure success.

Second, based on the experience and practice of the current associate degree programs, it is expected that students will transfer into the Chemical Engineering Technology program from other courses of study at the Michigan Tech. Current practice is that more than one-half of the graduates from associate degree programs at MTU are students who transferred from other curricula into the School of Technology. This new degree program will broaden the choices for students and aid in the retention effort on campus. Finally, the Chemical Engineering Technology program offers a new degree program for admissions counselors to publicize and thus draw new students to the University who would not otherwise be interested in our existing programs.

Accreditation

This proposal presents a curriculum that will meet the criteria for accreditation by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology. Under TAC/ABET guidelines, a class must graduate before a program can be considered for accreditation. Plans are to seek TAC/ABET accreditation as soon as this requirement is fulfilled.

Program Costs

Two new faculty are required to teach Chemical Engineering Technology classes in the curriculum. Their salary, during the first two years, is partially offset by funding provided by the National Science Foundation.

A supplies, services and equipment budget is needed to support the program. An allocation of \$5,000 per year is requested to support expenses associated with supporting the faculty and students in the Chemical Engineering Technology program.

Industry Involvement

The early visualization for this Chemical Engineering Technology degree program and particularly for the partnership with Delta College has come from our close industrial partners Dow Chemical Company and Dow Corning Corporation. Together these companies have over 1000 process operators involved with manufacturing diverse chemical and material products. Nearly all CPI companies struggle with in-house manpower upgrading programs which will keep process operators conversant with the rapid change in process management technologies, with more stringent environmental and safety regulations, and with the need for improved process efficiency. Industry is highly supportive of this Chemical Engineering Technology degree program as one step toward developing a reliable stream of graduates from which to hire. Industry is committed to working with Michigan Tech and Delta College faculty in developing a curriculum which meets and will continue to meet the needs of this important process position.

Laboratory Resources, Space and Equipment

This proposal is prepared with the cooperation and endorsement of the Department of Chemical Engineering. It is agreed that laboratory space is available in laboratories in the Department of Chemical Engineering. This includes, most importantly, capacity in the Unit Operations Laboratory to serve the students in this proposed program of study.

Office space can be found to house the new faculty members in the School of Technology.

Equipment to support this program is either already in place or will be supported with funding obtained through the National Science Foundation's Applied Technological Education grant program. The synergy of having engineering and engineering technology programs on the same campus, sharing the same facilities demonstrates high use and involvement of equipment donated by corporate sponsors. This should enhance opportunities to obtain additional pieces of equipment and funding.

Library Resources

Library resources are more than adequate for the support of a Chemical Engineering Technology program at MTU due to the strong Chemical Engineering and Chemistry programs already in place.

Summary

The Chemical Engineering Technology Associate Degree program has numerous positive aspects for Michigan Tech. The strong involvement of major chemical processors in Michigan, The American Chemical Society, and strong financial support from the National Science Foundation are measures of the external impact this program will have on the reputation of the University. Internally, the Chemical Engineering Technology program will have an impact on retention since it offers another non-engineering education path for students. Through our partnership with Delta College, MTU should attract larger numbers of minority students. MTU already has excellent support facilities in the Department of Chemical Engineering in their Unit Operations Laboratory and world-class pilot plant facilities in the Process Simulation and Control Center and the School of Technology is ready to offer the applications oriented classes to support the general studies in this program. Cooperative efforts between the Department of Chemical Engineering and the School of Technology, as well as, cooperation between Delta College and MTU, are strengths of this proposal.

Adopted by Senate: April 3, 1996

Approved by Administration: April 17, 1996

Approved by Board of Control: May 23, 1997