

The Senate of Michigan Technological University

PROPOSAL 9-85

DOCTOR OF PHILOSOPHY IN ENGINEERING GEOTECHNICAL ENGINEERING

BACKGROUND:

On May 2, 1984 the Senate adopted Proposal 3-84 which established the Ph.D. in Engineering Program. Proposal 3-84 requires that each of the program areas be approved by the Graduate Council and the Nondepartmental Committee followed by a recommendation for approval or disapproval from the Senate to the Vice President for Academic Affairs. On April 18, 1985, the Senate Curricular Policy Committee voted to recommend that the Senate recommend the approval of the proposed program in Geotechnical Engineering.

PROPOSAL:

The Senate of Michigan Technological University recommends the establishment of the Geotechnical Engineering Program under the Ph.D. in Engineering Program. A description of the program follows:

PROGRAM DESCRIPTION:

Introduction

Geotechnical Engineering at MTU centers on the properties of earth materials as they relate to human activities. Included in the geotechnical area are instructional and research opportunities in the areas of soil and rock mechanics, mining engineering and mine health, safety and reliability. The goal of the geotechnical program is to contribute to the solution of regional and national problems related to earth materials; such as the effect of climate on these materials, and the discovery and extraction of minerals in a safe and environmentally acceptable manner. Flexible programs enable students to prepare for professions in consulting, industry, government agencies, research and development laboratories, and universities that address problems related to geotechnical engineering. The aim, therefore, is to produce a highly educated engineer who will be equally at home (1) conducting research, whether in the lab or in the field, (2) designing sophisticated geotechnical projects, (3) executing the design under field or site conditions, and (4) educating and training future geotechnical engineers. The interdisciplinary nature of the geotechnical engineering program is illustrated by the number and diversity of departments involved, which include Mining Engineering, Civil Engineering, Geology and Geological Engineering, Electrical Engineering, and Mechanical Engineering/Engineering Mechanics.

Admission

A student is eligible for admission to the Geotechnical Engineering Program if he/she has obtained a Bachelor's Degree in Engineering in one of the physical sciences containing a geotechnical content. A candidate who does not come from such a program may be admitted

on the condition that he/she makes up deficiencies in a manner prescribed by the student's advisory committee. A student will be accepted to the program if he/she has exhibited capabilities and interest in independent research. Acceptance to the Ph.D. program is based on recommendation made by the Geotechnical Engineering Administrative Committee with the approval of the Dean of the Graduate School.

Course of Study

After the student's acceptance to the program, the Graduate Dean in consultation with the primary advisor will assign a permanent student advisory committee which will outline a specific program of study. The design of the academic program will depend on the student's background, research interests and educational objectives. A comprehensive examination will be given to determine the general knowledge to the student's program and his/her ability to use this knowledge.

TYPICAL PROGRAM

A Ph.D. program in geotechnical engineering should consist of approximately 2 to 3 years of study and research beyond the M.S. degree or 3 to 4 years beyond the B.S. degree. The blend of formal coursework and research will depend upon factors such as the availability of formal coursework to support the student's chosen research topic and the presence or absence of a thesis in the student's M.S. program. Because of the interdisciplinary nature of this degree program, it is expected that the student's program will contain one or more minors consisting of a sequence of upper division and graduate courses from a department other than the student's major department. A meaningful minor might approximate a quarter of effort. Minors would logically be pursued in the five engineering departments that comprise the geotechnical group, in mathematics, or in any of the physical sciences. Courses to broaden the student and to create a more well-rounded individual are also encouraged. Such courses might be chosen from the humanities, the social sciences, or business.

With this broad general background, one might anticipate a student's graduate program beyond the B.S. degree to consist of the following:

- One year of coursework encompassing courses for both depth in the student's area of geotechnical engineering and breadth in the major department.
- One quarter of effort on a mathematics, computer science or physical science minor.
- One quarter of effort on a minor outside the major department.
- One to two years of concentrated research effort on a dissertation topic.

In the above statements, "one quarter effort" does not necessarily infer coursework but can include directed and self-study.

RESEARCH AREAS

In order to provide some idea of the scope of the Geotechnical Engineering Program, it is worthwhile to list some but not necessarily all of the current research topics. The listing below, however, is not an inclusive one.

- Rock Mechanics
 - Deformation and fracture mechanics of rock
 - Rock Fragmentation

- Laboratory and in-situ measurements of rock properties
- Surface subsidence and support of mine excavations
- Slope stability in open pits

- Soil Mechanics
 - Cold regions earthwork engineering
 - Freeze-thaw effects on soils
 - Thermal properties of soils
 - Subsidence mechanisms in soil and rock
 - Geotextiles
 - Snow and ice engineering
 - Tailings storage

- Coastal Engineering

- Deep earth structures using magnetotellurics, seismic imaging and semismicity.

- Mine Health, Safety, and Reliability
 - Computerized mine ventilation planning
 - Mine climate precalculations
 - Mine fire fighting and emergency plans
 - Diesel exhaust in mining operations
 - Explosions and gas outbursts
 - Mine electrical safety and reliability
 - Noise control in the mining workplace

- Mine Economics
 - Mine evaluation
 - Mine operations research
 - Geostatistics

Adopted by Senate: 1 May 1985

Approved by Administration: 14 May 1985