

The Senate of Michigan Technological University

PROPOSAL 8-85

DOCTOR OF PHILOSOPHY IN ENGINEERING SENSING AND SIGNAL PROCESSING

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 University Graduate Council and the University Nondepartmental Studies Committee followed by a recommendation for approval or disapproval from the University Senate to the Vice President for Academic Affairs. The Dean of the Graduate School forwarded a statement describing the proposed program on January 2, 1985 with his endorsement. The Curricular Policy Committee reviewed the program and on March 11 voted to recommend that the Senate recommend to the Vice President for Academic Affairs the approval of the proposed program in Sensing and Signal Processing.

PROPOSAL:

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

PROGRAM DESCRIPTION:

Michigan Technological University
Doctor of Philosophy in Engineering
Sensing and Signal Processing

Introduction

The Ph.D. program in sensing and signal processing at MTU incorporates a broad range of disciplines and the foundations of the program include the physical sciences, engineering, mathematics and computer sciences. It deals with the acquisition and processing of information in a variety of possible types including optical, acoustical, biological, geophysical, mechanical and others. A student's program of courses is designed on an individual basis, building from fundamentals to advanced concepts and culminating in scholarly independent work. This work, a demonstration of the student's ability to expand the field of knowledge in sensing and signal processing, is documented in a Ph.D. dissertation and ultimately by scholarly publications.

Admission

The doctoral program in engineering is administered by the Graduate School and application for admission should be submitted to the Dean of the Graduate School. Specific questions relating to the program should be directed to the chairman of the Sensing and Signal Processing Faculty Committee (1984-85, Professor James Rogers).

Applicants for doctoral study in sensing and signal processing are judged by their previous achievements in academic coursework and research. Applicants must hold a baccalaureate degree in science or engineering with a component related to sensing and signal processing. The academic record should indicate superior achievement in coursework. Usually, applicants will either hold or be working toward the Master of Science degree and the M.S. thesis research should indicate superior ability in research.

Applications for doctoral study are reviewed by the Faculty Committee and this group will make a recommendation to the Dean of the Graduate School.

Program of Study and Research

The Doctor of Philosophy degree is a research degree and is awarded in recognition of demonstrated mastery of subject matter in sensing and signal processing and demonstrated competence in the conduct of a significant individual research investigation. Accordingly, the requirements for the degree are that the student must:

- a. Demonstrate a mastery of subject material in sensing and signal processing by successfully passing the Qualifying Part of the Comprehensive Examination.
- b. Prepare a specific proposal and plan for the doctoral research dissertation and demonstrate an in-depth knowledge and understanding of subject material and literature related to this research by passing the Oral Part of the Comprehensive Examination.
- c. Plan and conduct an original research project and prepare a research dissertation describing the methods, data, results and conclusions of this research.
- d. Defend the validity and significance of the research dissertation by successfully passing a Final Oral Examination.

A program of coursework is developed by the student's advisory committee on an individual basis. The purpose of the program is to aid the student in satisfying the degree requirements outlined above. There are no specific course or credit number requirements but the level of competence demanded by the degree requirements is such that the superior student will require about three or four years of full-time study and research beyond the bachelor's degree to satisfy these requirements.

EXAMPLE PROGRAM

The following program of courses and research is given as an example to illustrate an idealized chronological progression of a typical superior student from the B.S. degree through the M.S. to the Ph.D. In practice, some overlap would occur between the various stages of development.

Chronological Summary

- a. Three quarters or about 32 credits of M.S. coursework.
- b. One quarter or about 13 credits of M.S. research
- c. Award of the M.S. degree.

- d. Admission as a Ph.D. "Applicant."
- e. Tentative selection of the research topic and initial appointment of the Advisory Committee.
- f. Four quarters of additional coursework and research. Included in this would be advanced work in sensing and signal processing and in mathematics. It is expected that this work would include courses representing at least a quarter's effort in a cooperating discipline other than that of the student's principal area.
- g. Qualifying Part of the Comprehensive Examination. Areas of examination:
 - 1. Fundamentals of physics and mathematics
 - 2. System Analysis - linear and non-linear
 - 3. Topics from the recent research literature in the student's research area of interest
- h. Confirmation of Research Topic: Reappointment of Advisory Committee.
- i. One quarter for preparation of Research Proposal.
- j. Oral part of the Comprehensive Examination.
- k. Admission as a Ph.D. "Candidate."
 - l. Four quarters of research; successful completion of the research project; additional courses if so recommended by the Advisory Committee.
- m. Preparation of the Doctoral Dissertation.
- n. Final Oral Examination and Defense of the Doctoral Dissertation.

Under ideal conditions, the program would require about 14 to 16 quarters of time beyond the B.S. degree.

Adopted by Senate: 1 May 1985

Approved by Administration: 14 May 1985