

DATE: July 27, 2006

SUBJECT: University of Tennessee Knoxville, Master of Science in Reliability and Maintainability Engineering

ACTION RECOMMENDED: Approval

BACKGROUND INFORMATION: The proposed MS program in Reliability and Maintainability Engineering (RME) is designed to positively influence research grant opportunities at the University of Tennessee. With increased economic competitiveness, RME has become a service supplied to manufacturers. Most large manufacturers contract out a major percentage of their RME activities. Historically, maintenance and reliability specialists are working adults who do not have the option of a professional degree. Through distance delivery, these working professionals will have the opportunity to learn the theoretical and practical aspects of this discipline. Specific goals of the proposed MS program in Reliability and Maintainability Engineering are:

- To educate and produce graduates with the ability to understand and apply the techniques, skills, and modern engineering tools necessary for professional practice in reliability and maintainability engineering.
- To contribute to the economic development of the state by training highly qualified graduates in the field to support industry and government.

The key components to this program have existed as a concentration since 1996 at the University of Tennessee Knoxville and have the necessary critical mass of faculty, staff, facilities, and students needed to be successful.

PROPOSED START-UP DATE: Fall 2006

Commission staff has reviewed program proposals according to the academic standards adopted by the Commission on November 14, 2002. Each standard is referenced below.

1.1.20A MISSION: As the state’s primary comprehensive research institution, the proposed program is consistent with the mission of the University of Tennessee Knoxville and the academic vision of being a top-tier research university.

1.1.20B CURRICULUM: The proposed curriculum requires completion of 30 semester hours. The curriculum is a repackaging of existing courses, therefore requiring no additional courses. Several courses from the Statistics department are planned to satisfy elective requirements. The program is designed to be offered both on campus and at distance through a synchronous, interactive, web-based, cyber-class delivery system. The College of Engineering currently offers distance education MS degrees in Civil Engineering, Environmental

Engineering, Industrial and Information Engineering, Nuclear Engineering; and graduate certificates in Nuclear Criticality Safety and Maintenance and Reliability Engineering.

1.1.20C ACADEMIC STANDARDS: Applicants for admission to the MS program in Reliability and Maintainability Engineering are expected to have earned a bachelor's degree from an accredited undergraduate program in engineering or physics. Students from other appropriate disciplines (e.g. chemistry, mathematics, etc.) can be admitted but additional engineering courses may be required. Entering students are required to have minimum, competency in mathematics through ordinary differential equations.

Student Projections	Projected Program Productivity		
	Full-time Enrollment	Part-time	Graduates
Year 1	2	6	0
Year 2	4	13	2
Year 3	6	24	4
Year 4	8	30	12
Year 5	10	34	24

1.1.20D FACULTY: The proposed program is an interdepartmental program in the College of Engineering with professors teaching classes from several departments. No additional faculty is required.

1.1.20E LIBRARY RESOURCES: Current library resources are adequate to support the proposed program.

1.1.20F ADMINISTRATION/ORGANIZATION: The proposed program will be offered on campus and on-line and administered through the College of Engineering, Department of Nuclear Engineering in collaboration with the Department of Statistics, Operations and Management Science. The program will be coordinated by a current member of the faculty.

1.1.20G SUPPORT RESOURCES: Some of the companies involved with the UTK Maintenance and Reliability Center include the Tennessee Valley Authority, Eastman Chemical Company, Saturn, Nissan, Alcoa, and Arnold Engineering.

1.1.20H FACILITIES/INSTRUCTIONAL EQUIPMENT: Current facilities and instructional equipment are adequate to support the proposed program.

1.1.20I STUDENT/EMPLOYER DEMANDS: Ten years ago the Maintenance and Reliability Center (MRC) was formed under the College of Engineering. This Center has been successful and currently has 30 industrial members, many of whom are from Tennessee, but are also broadly based throughout the nation. The Center hosts an annual Maintenance and Reliability conference (MARCON) that draws between 150 and 200 attendees. The Center's advisory board and industrial members have been requesting a degree program in RME for some time, and several years ago UTK

partnered with Monash University (Australia) to market their distance delivered MS degree. That program currently has 38 U.S. students. There is a strong industrial need and interest for a U.S. based degree. The University of Maryland has the only program in Reliability Engineering, graduating about 15 MS and 3 PhD students per year.

A survey was administered to 35 industrial members of the UT Maintenance and Reliability Center. The population consisted of upper level managers, many who run the maintenance department in manufacturing plants or run the corporate level maintenance departments of multi-factory corporations. The interest expressed by respondents was strong and supportive.

1.1.20J NO UNNECESSARY DUPLICATION: There are presently no graduate programs in the state of Tennessee leading to the Master of Science in Reliability and Maintainability Engineering.

1.1.20K COOPERATIVE INSTITUTIONS: None indicated.

1.1.20L DESEGREGATION: The program will not impede the state's effort to achieve racial diversity.

1.1.20M ASSESSMENT/EVALUATION AND ACCREDITATION: The ABET accreditation for the College of Engineering covers all programs in the college. There is no separate accreditation for graduate programs. There are no SACS implications. Program reviews will be conducted in accordance with University policy. Reviewers from similar departments on the UT Knoxville campus and reviewers from other universities with similar ranking as that of UT will perform the review. The College of Engineering will receive the evaluation results for program improvement, development, and planning.

1.1.20N ARTICULATION: N/A

1.1.20O EXTERNAL JUDGMENT: Dr. Elsayed A. Elsayed, Distinguished Professor and Director, NSF Industry University Cooperative Research Center for Quality and Reliability Engineering, School of Engineering at Rutgers University provided the expert external review of this program. Dr. Elsayed's described the proposed program as unique and important to industry. He was familiar with the concentration offered since 1996 with Monash University (Australia), the Maintenance and Reliability Center and the qualifications and research of the faculty. Based on the needs in the profession and the stature and quality of the College of Engineering, he indicated that graduates would be highly recruited and strongly recommended the program be approved.

1.1.20 COST/BENEFIT/SOURCE: There are no additional costs required to implement the proposed program. The current concentration was developed through a National Science Foundation, and a Research Curriculum Development grant. No external sources of funding are specified, however it is expected that the program will increase the visibility of the research in this area and the program coordinator will submit and coordinate grant proposals in this area for additional research funding and

overhead recovery. Several departments currently have research grants to support graduate students. The proposed program will contribute to meeting an educational need of the state and the nation, resulting in a more efficient and competitive industrial base. Reliability and Maintainability engineering is important for all manufacturing facilities. East Tennessee has been the leader in these technologies with several years.

1.1.30 POST APPROVAL MONITORING: An annual performance review of the proposed program will be conducted for the first five years following approval. The review will be based on goals established in the approved program proposal. At the end of this period, campus, governing board, and Commission staff will perform a summative evaluation. These goals include, but are not limited to enrollment and graduation, program costs, progress toward accreditation, library acquisitions, student performance and other goals set by the institution and agreed upon by governing board and Commission staff. As a result of this evaluation, if the program is found to be deficient, the Commission may recommend that the governing board terminate the program. Copies of such recommendation will be forwarded to the Education Committees of the General Assembly. The Commission may also choose to extend this period if additional time is needed and requested by the governing board.