THEC External Review
Master of Science in Engineering
The University of Tennessee at Chattanooga
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By

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INTRODUCTION

Thank you for the invitation by the leadership of the College of Engineering and Computer Science, University of Tennessee at Chattanooga to serve as the external reviewer for the Master of Science (MS) degree in Engineering.

This program has seven engineering concentrations: automotive systems, chemical, civil, computational, electrical, industrial, and mechanical. Some of the concentrations have focus areas. The concentrations in the degree program are supported by four areas of courses: mathematics or engineering analysis, approved electives (in mathematics, science, or engineering), engineering concentration, and thesis or special project and/or internship. Students can select either thesis option or project option. Number of credit hours required for graduation range from 30 to 33 depending on thesis or project option. Students can also pursue MS in Engineering Management, MS in Computer Science, and PhD in Computational Sciences. In addition, several graduate certificate programs are also available to interested students. Integration of SimCenter has started showing results in terms of increased research activity and research grants.

This assessment is based on a review of the self-study prepared by the College and a site visit from April 16 through 18, 2017. During the site visit, interviews were conducted with alums, current students, supporters of the college, faculty members, staff members, and the college and the university administrators. This report is based on the condensed verbal report provided at the end of the site visit. The report has seven parts, and is prepared according to the guidelines provided to me.

PART 1 – Learning Outcomes

The MS Engineering program has three learning outcomes and are consistent with the mission, the vision, and the goal statements:

- Communications
- Engineering Fundamentals

- Technical Writing

These outcomes are regularly assessed using well-designed rubrics. The collected information is evaluated regularly to identify the areas of improvement and efforts are directed to improve the outcomes – a continuous improvement process.

The College of Engineering and Computer Science is encouraged to create research opportunities for its students and encourage its faculty to pursue research funding. In addition, the College can be creative in identifying internship opportunities for its students with the local/national industries, and opportunities for faculty members to spend some time (possibly in summer semesters) with the local industries. Such practices will bring industrial perspectives to the classroom and will benefit the students, faculty members, and the College/University in many ways. Such a practice will also create a mechanism and opportunities for placement of graduates.

PART 2 – Curriculum

As the academic landscape is changing much faster than before, it is important for the academic institutions to be more responsive to meeting the workforce needs of businesses. For the Colleges of Engineering, it has become almost a necessity to strengthen ties with the relevant businesses, solicit their feedback, assess their needs, and adjust the curriculum to empower graduates to become more marketable and productive. The College of Engineering and Computer Science at University of Tennessee at Chattanooga is already doing so and is strongly encouraged to continue this practice.

The curriculum for the MS Engineering program is revised regularly as needed. A new concentration has been added, new courses have been introduced, and additional courses have been made available online. The current curriculum and the existing practices to revise it provide ample opportunities for students enrolled in the program to develop necessary skills and to be a productive member of the workforce.

The curriculum is flexible and the course offerings are at an adequate frequency for students to make steady progress towards their graduation. At a minimum two core courses and two elective courses are offered in each Fall and Spring semesters. Students can finish their degree in two years. In addition, students have excellent opportunities to be involved in professional development and extracurricular activities through professional organizations and local industries. Integration of SimCenter and students' involvement in it may improve the learning environment significantly.

In meeting with the students, the excitement among students was visibly evident. The students were very pleased with the learning environment and the support they receive. The enrollment in some of the concentration is better than others. Efforts should be made to boost the enrollment in all of the concentrations so that all student can pursue their educational goals in the same learning environment as others do. Students also indicated that some marketing materials may be helpful to create an awareness of the graduate programs among the undergraduate students. This approach will also be particularly fruitful in attracting employees of the local industries to

enhance their skills by pursuing an MS degree. In addition, the College may consider creating a joint BS/MS degree program where undergraduate students can take some graduate courses that will satisfy partial requirements for both BS as well as MS degrees.

PART 3 – Student Experience

The degree program is doing very well. The students feel engaged and excited about the learning environment. However, a review of the enrollment numbers in various concentrations indicates that some of the concentrations are doing better than the others. The enrollment in Electrical Engineering concentration is solid and the University may consider to create a separate graduate degree in this field. The enrollment in Computational concentration may have dropped due to reorganization of SimCenter and will increase as the SimCenter is fully integrated and research grants start coming in. To grow enrollment in other concentrations, aggressive marketing to create national and international awareness may be necessary. The total enrollment in the MS Engineering, however, is still reasonably healthy and variations are within reasonable range.

The applicants seeking admission to this degree program are required to:

- Hold a baccalaureate degree from a regionally accredited college or university or foreign equivalent;
- Have a minimum grade point average (GPA) of 2.7 on a 4.0 scale *or* a 3.0 in the senior year;
- Have a minimum of 550 paper-based, *or* 213 computer-based, *or* 79 internet-based TOEFL score *or* 6.0 on the IELTS for international students;
- Submit a letter of recommendation from a senior manager *or* a professor;
- Submit official transcripts from each institution previously attended; and
- Complete the Graduate School application form and pay a non-refundable fee.

After the students are admitted to the program, their orientation, support, academic advising, placement efforts seem to be adequate. Enrollment and retention of graduate students will improve significantly by improving the funded research activities in the College and involving graduate students in funded research projects. Increasing the stipends for graduate students will also improve the enrollment and retention.

Students are very pleased with the opportunities for professional development through the professional organizations, conferences, and interaction with industries. They are also very pleased with the learning and support environment in the College. A diverse student population and a diverse faculty provide solid experience and perspective on multicultural aspects.

PART 4 – Graduate Faculty Quality

The College has 40 tenured and tenure-track faculty and 18 non-tenured faculty members. Thirty nine (39) of those are among the three departments that have concentrations for MS in Engineering. They are all qualified to teach graduate courses and to advise/supervise graduate students. Each department has a graduate coordinator with responsibilities for the concentrations

in their departments. They are also responsible for advising graduate students, reviewing graduate student applications, and recruiting graduate students in their concentrations.

The faculty members have strong credentials and doctoral degrees in appropriate disciplines to educate and prepare graduate students. They have excellent background in their fields and are effective in teaching their courses. Many faculty members have strong relationship with local industries including Volkswagen, Tennessee Valley Authority (TVA), and Electric Power Board (EPB). That should translate to some research projects for the College which are sponsored by the local industries.

The faculty members in the College are engaged in research and scholarship activities. They are active in pursuing research projects and research publications. The teaching loads of faculty members are higher than normal and that may keep them from pursuing additional research and scholarship activities. For enhancing research, some adjustments may be necessary to balance faculty assignments for research, teaching, and service. It is understandable that achieving full research potential of faculty may take some time but initiatives to make that happen should start as soon as practically possible.

PART 5 – Learning Resources

The equipment in instructional laboratories and instructional equipment in classrooms are excellent. The College regularly evaluates its (laboratory and instructional) equipment including software and makes improvements as deemed necessary. The computers in the classrooms were all modern and well maintained. Policies and procedures are in place for using the equipment safely.

Students and faculty have access to information resources to support teaching and learning through newly constructed University Library. The Walker Center for Teaching and Learning provides generous support to faculty by offering development and training sessions to use the available instructional resources.

The newly (in January 2015) opened 184,725 square feet library facility is excellent and provides generous access hours. In addition to traditional resources such as reference material in digital form for researchers, the library also provides supports in terms of Studio recording space, impressive computing support, 3-D modeling and printing, and audio visual equipment. The library also provides 37 group study rooms, practice presentation rooms, 8 conference rooms, and a large number of computer stations. This facility is simply excellent.

PART 6 – Support

Staff members are very competent and provide an excellent support to the faculty and the students. The number of support staff members seems to be barely adequate to support the current level of teaching and research activities. As the research activities and the enrollment grow, additional support staff may be necessary to sustain the research growth and teaching environment. Technical support appears to be adequate at the current level of demand.

The level of support from the University leadership and the research support office is strong. Faculty members should be made aware of the available support infrastructure and they should be encouraged to utilize the available resources and services.

PART 7 – Summary Recommendation

The MS degree program in Engineering with its concentrations and focus areas is excellent. Some concentrations are doing better than others. The instructional laboratories are well-equipped and the instructional equipment in classrooms is excellent. Faculty, staff, and students are very enthusiastic about the degree program. The degree program has strong support from the University administration, local businesses, and community. The College leadership is working on further strengthening ties with the industries. The plans of the City of Chattanooga to create a smart city provide tremendous opportunities for the city and the college work together. The support structure for instructional as well as research activities is solid. Integration of SimCenter is a good step to enhance research and to grow graduate enrollment.

There are two major expectations that will make the degree program stronger:

- Enrollment growth
- Research growth

Following are a few recommendations for meeting these expectations:

For enrollment growth:

- Enhance the marketing efforts for the degree program. These efforts should target audience inside and outside the University including the employees of local industries. The marketing efforts should also target international students.
- The graduate certificate programs must be periodically reviewed to assess their relevance. Additional certificate programs with focus on areas such as data analytics, cyber security, and smart systems may be helpful and align well with the city's ambitions and future plans.
- Introducing joint BS/MS degree program may be helpful in motivating the current undergraduate students to pursue MS degree.
- Increase research opportunities for graduate students by pursuing funded research from State and National funding agencies and from local industries.

For research growth:

- Faculty members should be encouraged to fully utilize the services/support provided by the University's research office.
- Faculty assignments need to be adjusted to reflect emphasis on research and to establish clear expectations and encouragement for pursuing research.

- Faculty members are encouraged to pursue NSF's program on Industry-University Collaborative Research Center (IUCRC) and invite industries' participation including TVA, EPB, Volkswagen, Amazon, City of Chattanooga and others.
- Encourage and support faculty members to visit funding agencies and serve on NSF's review panels.
- Invite funding agencies to campus and arrange research workshops for faculty members.
- Provide support for faculty members who are interested are interested in retooling their skills for research.
- Encourage and support collaborative and interdisciplinary research activities with other Colleges and Universities.
- Strengthen ties with local industries and encourage faculty members to explore opportunities for spending their summer semesters with the local industries.

I would like to express my sincere thanks and gratitude for this opportunity. Everyone I met with during the site visit was warmly welcoming. My special thanks go to Dr. Neslihan Alp for her hospitality and for making this visit a very pleasant experience.

Respectfully submitted,

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