Academic Program Review Report for the Department of Industrial and Systems Engineering

October 16, 2018

The Committee was asked to consider the following questions during its review of the Department of Industrial and Systems Engineering:

- Are they doing what they should be doing?
- Are they doing it well?
- How can they do things better?
- How should the University assist them?

The remainder of this document addresses these questions by considering the strength of the Department, the challenges that it faces and provides recommendations for improvements.

Strengths

The Department clearly fulfills its research, education and outreach mission. The Committee identified the following strengths:

- Strong and dedicated leadership
- Recruitment of excellent junior faculty
- Excellent mentorship of junior faculty
- Very good student quality at the undergraduate and graduate levels
- Very supportive advisory board
- Effective execution with limited resources
- Clearly identified focus areas.

Challenges

The Committee identified the following as the major challenges that the Department faces:

- Space is a major concern:
  - Existing space is dysfunctional, unattractive, and of poor quality
  - Its non-contiguous nature affects cohesiveness
  - Lack of office and lab space limit opportunities for growth
  - Air quality issues should be addressed immediately, particularly in the graduate student office
  - The Committee notes that the same issues were raised in the previous review
- The Department is small compared to its aspirational peer group with respect to both faculty and student numbers
- Limited discretionary funds available for faculty recruitment and new initiatives
  - The Department's endowment is small

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Recommendations

In order for the Department to achieve its full potential, the Committee provides the following recommendations for consideration by the University, the College of Engineering and the Department:

- The Department, in collaboration with all its stakeholders needs to develop a comprehensive strategic plan extending over the next decade
    - Finding continuous and higher quality space quickly is essential for the success of the Department and its long-term future
    - The Department, in collaboration with the Dean, should develop a clearly-articulated long-term hiring plan
    - The Department should explore whether other focus areas would get strong support from local industry
    - Considering its small size, the Department should choose in which sub-fields within their chosen focus areas they want to excel and become internationally recognized leaders
- The Committee feels that the Department leadership could be more transparent with the faculty about its budget and its allocation towards Department priorities
- The Staff would benefit from a better understanding of the vision and strategy of the Department
- The Chair should consider delegating the role of undergraduate coordinator to another faculty member and invest the recovered time into developing the Department's strategic direction
- The Department should consider increasing its investment in marketing and communication, especially to alumni and local industry
- The Department should make focused efforts to take a leadership role in systems engineering as applied to multiple areas of importance to the College, such as data science, multi-scale manufacturing and health.

Conclusion

The Committee recommends that the next review take place in ten years.

Committee Members

- Prof. Daniel Kirschen, Department of Electrical and Computer Engineering, University of Washington (Chair)
- Prof. Mehmet Sarikaya, Department of Materials Science and Engineering, University of Washington
- Prof. Rakesh Nagi, Department of Industrial and Enterprise Systems Engineering, University of Illinois at Urbana-Champaign
- Prof. Abhi Deshmukh, Department of Industrial Engineering, Purdue University

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Response to Unit-Defined Questions

1. What can we do to modernize our undergraduate curriculum?

Our core undergraduate curriculum is typical of most industrial engineering programs. ISE is continually adapting it to provide new learning opportunities to our students. For example, in data analytics, we have modified some core classes, created classes, and started conversations with the UW e-Science Institute. We are seeking advice on how we can modernize our undergraduate curriculum along these lines within the constraints placed by ABET.

- Updating statistics course using real data
- Consider separating probability and statistics
- Reinforce programming
- Make the professional practice seminar a required course

2. How can we help our undergraduate students secure better jobs?

Some of our undergraduate students are interested in securing jobs in the flourishing high-tech industry. A traditional industrial engineering curriculum may not prepare them for all such opportunities. We are soliciting ideas on how we can help them secure a broader range of jobs.

- Define track options that do not need to have to appear on transcripts
- Develop a corporate partner program

3. What graduate course offerings are needed in our three research areas to (1) recruit outstanding graduate students, and (2) prepare them to secure faculty positions at Tier 1 schools?

Because of our small faculty size, ISE is only able to offer a minimum selection of graduate course offerings. Our graduate students try their best to enroll in relevant courses across campus. However, the flavor of these courses is different from what a typical ISE offering would be. As such, our MS and PhD students do not have adequate choice of advanced courses and technical electives. This negatively affects our student recruitment efforts. In the case of PhD students, it also hurts their chances of securing faculty positions after graduation. We are seeking advice as to how we can address this concern.

- Increase faculty size
- Collaborate with CSE and other departments
- Strategic hiring in the focus areas

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4. How can we make our professional graduate programs more appealing to a broader group of local industries?

A list of industries that currently send their employees to our MISE and graduate certificate programs is included in Appendix R. As the list shows, most students are from Boeing. The MISE program coordinator and academic counselor work hard to reach out to other industries as well. We are seeking ideas on how we can further enhance those outreach efforts.

- Hire affiliate faculty members and professors of practice

5. What are the pros and cons of potentially making a thesis mandatory for our MS degree?

ISE faculty have debated requiring a thesis for the MS degree. We wish to receive input from the review committee about the pros and cons of such a potential change.

- Committee and Department share the same views on the pros and cons

6. What are the strengths and weaknesses of our junior faculty mentoring program?

Up until about 5 years ago, ISE did not have a formal program for mentoring junior faculty. The Chair and the Associate Chair have now established such a program. We are seeking advice from the review committee regarding strengths and weaknesses of this new effort.

- Department is doing a great job at mentoring junior faculty

7. How can we better mentor our mid-career faculty?

Mentoring of mid-career faculty is currently limited to the annual merit review process. At this point, we have only one Associate Professor in the department, but we hope that within one or two years, this number will go up to 3-4. We are seeking input on how to establish a formal program to mentor mid-career faculty.

- The committee has the impression that the faculty members believe that they are not masters of their own destiny

8. How can we get chaired professorships from local industries (e.g., Amazon, Boeing, Microsoft)?

Our collaborations with local industries are limited to individual faculty projects; participation in the EAB; the MISE and graduate certificate programs; capstone projects; and undergraduate scholarships. The Chair and the COE advancement team are working hard to secure more substantial funds that can help raise the department's profile in the industrial engineering professional community. In particular,

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the department is interested in securing endowed chaired professorships to help us recruit and retain top senior faculty. We are seeking ideas on how to achieve this.

- Department should also consider alumni giving
- Rising stars professorships for assistant and associate professors
- Consider creation of faculty scholars (one time 20K + keep the title)

9. How can we leverage our geographical advantage to obtain more resources?

One of the strengths of UW is its location. Seattle is a major technological hub in the US with temperate weather and avenues for a variety of indoor and outdoor activities for its residents. We have been able to use this to our advantage in recruiting students and faculty. In conjunction with Question 8 above, we are soliciting advice on how to further utilize this advantage in concrete ways to secure resources such as funds, space, and faculty lines.

- Nothing to add

10. How do we enhance our visibility in data analytics initiatives on campus to get faculty lines?

Faculty in all three thrust areas have long been active in research and education in data analytics. However, ISE does not have sufficient visibility on campus in this field. We are starting to make some inroads by introducing courses and interacting with the UW e-Science institute. We would like to learn how the department can raise its profile in this field to secure concrete benefits such as faculty lines.

- Emphasize what makes ISE unique in this area: **data systems**
- Support campus-wide coordination

11. What strategies can the department employ to obtain contiguous space for faculty, staff, and students?

ISE offices and lab spaces are currently spread across at least four buildings despite our small size. This makes collaboration and coordination between faculty, staff, and students difficult, and hurts our research and educational missions. ISE has tried to secure contiguous space over the last 2-3 decades. These efforts have been unsuccessful. ISE is soliciting fresh ideas from the review committee to help us overcome this challenge.

- Continue working with the Dean's office

12. How can we better utilize our executive advisory board to enhance our program?

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The ISE EAB began as a visiting committee, where they were passive participants, with the department providing them updates and presentations from faculty and students. While updates and presentations are still included, we have restructured the board to be more active. We have formed three subcommittees centered on student advancement, community relations, and strategic planning. ISE is soliciting ideas from the review committee on this structure and ways to leverage our EAB to enhance our reputation in the community.

- Involve student clubs
- Continue developing the strategic aspects of the board's work

13. How can the department help staff with their professional development?

We have a very collegial staff, and several of them have been part of ISE for over two decades. We are soliciting ideas from the review committee to help identify resources to help staff achieve their professional goals.

- Departmental staff awards

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