國立清華大學九十六年度系所評鑑
工程與系統科學系自我評鑑

評鑑委員意見

評鑑委員：王康隆 教授
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邱民京 教授
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中華民國九十六年五月

95 學年原科院系所評鑑委員訪問行程表 (1/2)

單位：工程與系統科學系

時間/地點	活　動　內　容
第 一 天（5 月 8 日）	
8:30 205 會議室	院長接待及簡報
9:00~9:50 205 會議室	系主任簡報，全體評鑑委員參加。
10:00~10:50 205 會議室	課程/研發召集人簡報，全體評鑑委員參加。
11:00~12:10 教學/研究實驗室	實驗室參觀 （行程由評鑑委員建議或各組老師安排，請實驗室負責老師引導解說）。
12:15~14:00	午餐（委員用餐地點另行公告，學生在 105 講堂用餐）
14:10~16:00 教學/研究實驗室	實驗室參觀 （行程由評鑑委員建議或各組老師安排，請實驗室負責老師引導解說）。
16:10~18:00 各組座談地點 另行公告	評鑑委員與教師個別座談：分為五組同時進行，原則上每組五人，以一對一方式，每人約 20 分鐘。
18:10~ 地點另行公告	晚餐

95 學年原科院系所評鑑委員訪問行程表 (2/2)

單位：工程與系統科學系

第 二 天(5 月 9 日)	
8:30~8:50 院長室	院長接待
9:00~10:50 各組座談地點 另行公告	評鑑委員與教師進一步個別座談：分為五組同時進行，原則上每組五人，以一對一方式，每人約 20 分鐘。
11:00~12:20 地點另行公告	學生座談：大學部(105 講堂)，研究生(205 會議室) (兩組同時進行、請評鑑委員自選參加組別、請教師迴避) (請系會事先通知安排學生約 20-30 人參加各組座談)
12:30~ 地點另行公告	午餐
14:10~15:30	評鑑委員討論撰寫報告事宜
15:40~16:50	評鑑檢討：評鑑委員講評(整體評鑑檢討並與教師交換意見)，全體評鑑委員參加。
17:00~18:20	全體評鑑委員向校方簡報評鑑結果(院長作陪)
18:30~20:00	晚餐

Comments of

王康隆 教授，邱民京 教授，陳守信 院士，郭　位 院士，

程海東 校長 ， 廖楷輝 教授

This report summarizes the review of the Department of Engineering and System Science (ESS) held during May 8-9, 2007. The review includes three main sections: (1) strengths, (2) concerns, and (3) recommendations.

Strengths

Based on the statistics provided by the department and the on-site review, the panel considers the overall performance of ESS department is good and well balanced as a higher education entity. Most notable strengths are as follows:

1. Faculty Quality – This is one of the most significant strengths of the department. Virtually every faculty member contributes toward the department constructively, either by teaching, research, service, or their combinations. The development of junior faculty is particularly impressive, which suggests the department will have a bright future. As a tradition, ESS department is a very collegial. Faculty appears to get along very well.

2. Uniqueness in Nuclear Engineering – The department has an unusual strength in various facets of nuclear engineering. While faculty hiring in the past decade has primarily been non-nuclear, the department still inherits enormous expertise and infrastructure to actively engage in the potential nuclear energy renaissance.

3. Research – Based on the faculty presentations, publication/funding statistics and laboratory tours, research in the ESS department is evidently well emphasized and accomplished. The funding level and publication records for the faculty are deemed to be first rate by the international standard.

4. Education – ESS faculty does take teaching seriously. The students interviewed by the visiting committee show great satisfaction with the education and learning experience they have with their professors. Quite a few faculty in the department have received teaching awards and recognition by the university in recent years. The department has four different technical tracks which provide students with great flexibility for curriculum and career planning. The curriculum for each track appears to be well structured with a good blend of breadth and depth.

Concerns

While the department has no obvious weakness, there are some concerns mostly pertinent to the future of the department as follow;

1. Faculty Demographic Distribution and Hiring – It is a likely scenario that half of the ESS faculty may retire in the next decade. There are two issues of concern. First, the department will soon become "head light," so leadership and junior faculty mentoring would be a challenge. The second issue, which is deemed to be more critical, is that virtually all the to-be-retirees are of nuclear engineering (NE) background. Without well-planned and expedited hiring, the NE program that is unique in Taiwan could be extinguished. The issue could be further complicated as the supply or hiring pool of nuclear faculty is expected to be highly limited in the foreseeable future. The department needs to coordinate with the university administration to develop an effective hiring strategy in resolving this issue.

2. Research - Although the current research quality and productivity in the department is deemed to be strong, the areas of focus could be overly diversified. As the government has been investing substantial resources in an attempt to elevate the university toward the world class level, more robust and focused research programs may be needed. The department may want to identify one or two niche areas for concerted pursuit towards the world leader of these areas. Overall, future research directions in the department need to be better defined and integrated.

3. Education - The ESS curriculum, though offers great versatility and depth, might be too rigid with too many required courses. The department may want to provide the students with more flexibility and to allow more technical electives. Another teaching related issue is concerned with the teaching facilities in the current ESS building. The current classroom settings are rather traditional and may be somewhat outdated for strongly interactive learning. In addition, neither the department nor the university seems to have structured guidelines for consistent maintenance of instructional laboratories.

4. Student and Research Staff Recruitment – Over the past decade, the ESS department has been devoting enormous effort and achieving reasonable success in recruiting better students in both undergraduate and graduate levels. However, the caliber of the incoming students can still be higher. This will require sustained and concerted recruiting efforts participated virtually by the entire university community. A more serious recruiting concern is the hiring of research staff, particularly the post docs. The ESS faculty has been experiencing difficult time to recruit qualified post docs both domestically and from abroad. This could be a factor hindering future research productivity.

Recommendations

The review committee has made the following recommendations;

1. The ESS department should continue its effort in promoting its ranking amongst all the engineering and science departments in the country. Higher ranking will have a direct impact on student recruiting and graduate placement. The department should actively promote placing its doctoral students on academic positions.

2. Working with the college and the university, the ESS department should develop a viable plan for hiring nuclear engineering faculty. This is critical to the future of the department, as well as to Taiwan's nuclear energy community.
3. In addition to nuclear faculty, the department should come up with a roadmap of the overall faculty hiring strategy, in line with the future plan of the ESS department. If the current research portfolio remains more or less the same, the hiring strategy for post-doc researchers should also be established.

4. It is a welcoming news that the university is (re)establishing the Institute and Nuclear Engineering and Science. Undoubtedly, the new Institute and the ESS department will have close tie and certain overlaps in their missions. Both entities should have well structured strategic plans in fostering the mutual relationship and identifying collaborative opportunities.

5. To enhance nuclear research capabilities in the department, it may be beneficial to establish a Scattering Center. Detailed proposal of the center was given by one of the review members, Dr. S.S. Chen.

6. The department is strongly encouraged to engage in more international collaboration in both education and research fronts. Today's students need to be better prepared for the globalization economy. Following the idea being pursued by several leading universities in the U.S., the students are encouraged to participate in at least one international experience before their graduation.

Comments of
何志明 院士

Review Comments
Engineering and System Science Department

ESS Department has made significant progresses in the past few years. The newly established micro/nano technology field and the long existing nuclear engineering program have made this department to possess unique strength in Taiwan. While energy becomes the major focus of worldwide research trust, the ESS department may reach international influential position with proper strategic planning.

The collegial culture of ESS department to cultivate young faculty members has proven to be a main reason of its success in transition and is highly recommendable. This culture is known in Taiwan universities and means potential of attracting young talents. It is a great asset for the department.

Research

Potential:

Energy becomes the top propriety of worldwide attention. Except nuclear fusion research which is still developing the production technology, all the rest of the efforts are mainly on improving the efficiencies of various existing technologies. Sensor and control schemes are the key techniques for achieving the goal. Among all the available energies, nuclear fission will be the major new energy supply, but the progresses of technology in this area are limited in the past few decades. ESS department has an excellent nuclear engineering group and a highly reputable micro/nano technology group. ESS department holds extremely favorable strategic position in establish its prominence, not only in Taiwan but also in the world.

Applications of micro/nano transducers in bio-medical application will continue to grow and possess unlimited potential. These efforts in ESS department should continue and expand as needed. New efforts of developing micro/nano transducer network for improving energy system, e.g. nuclear power plant and fuel cells, performance and efficiency should be a new developing direction for ESS department.

Gauge of Success:

Numerical indices, e.g. paper per faculty, citation per paper, should be use as a reference for the research accomplishments, but can not be the only gauge. Quality can not be completely represented by quantity. Over emphasizing the number game will eventfully bring damage to the future development, especially for the young faculty members.

If index is use, precautions need to be exercised. For example, it is well known that values of impact factor of engineering journals are far below the science journals. Simply for increasing the average impact factor of papers, a good engineering paper will lose its true "impact" by publishing it in to a low end science journal for receiving high impact factor.

Education

Faculty:

The average age of the faculty members are in the 50s. In a few years, a significant portion of the senior faculty will retire. This will be a crisis and also an opportunity. ESS department should start to develop a long range development and hiring plan now. It will be unhealthy and most time unsuccessful by hiring a large number of faculty members in a hasty way.

Interdisciplinary Education:

Nuclear engineering is an interdisciplinary field, so does the micro/nano technologies. The fundamental of interdisciplinary education is in the undergraduate stage, especially in the freshman and sophomore years. Deep training in physics, mathematics, chemistry and biology is the essence of interdisciplinary education, not just providing introductions to a broad scope of topics. At least 1.5 to 2 years training in these four fundamental courses is necessary for students to adapt to the fast changing world. With in-depth fundamental education, students will be easy to learn engineering courses and any new knowledge in the future.

Vision and Leadership:

The goal of any first rated university is to train student to be a leader not a technician. General education is the pathway of educating young people with vision and leadership. However, general education is always a weak educational link in engineering schools. How will ESS department handle this challenge?