UCC Program Review Committee summary of review

Program – Department of Chemical and Biomolecular Engineering

This program includes the following degrees and certificates:

- B.S. in Chemical Engineering
- B.S. in Chemical Engineering - Biological Track
- B.S. in Chemical Engineering - Energy and Environment Track
- B.S. in Chemical Engineering - Materials Track
- M.S. in Chemical Engineering
- Ph.D. in Chemical Engineering
- M.S. in Biomedical Engineering

Recommendation

This program is found to be viable, see report for commendations, concerns, and recommendations.

Comments – non-binding

This review was one of several to use the program’s accreditation process as part of the review, in this case only for the undergraduate program.

The next review may be timed to coincide with the accreditation of the undergraduate program in order to reuse some self-study materials, but, there should be a site visit involving internal and external reviewers.

Date of last review – AY 2006
Date of this review – March 2014

This review has been sent to program chair, she had no comment.
This review has been sent to program college dean, he had no comment.
This review has been sent to graduate council, they have no comment.
University Curriculum Council
Academic Program Review Committee

15 February 2015

Review of Department of Chemical and Biomolecular Engineering

- BS - Chemical Engineering
- BS - Chemical Engineering - Biological Track
- BS - Chemical Engineering - Energy and Environment Track
- BS - Chemical Engineering - Materials Track

Hans Kruse, Reviewer

Recommendation: Viable

Faculty
The department is served by 11 full-time faculty (based on the updated self-study from 2010). Additional teaching capacity is provided by one retired faculty member and one faculty member with mostly administrative duties.

All faculty have appropriate credentials for the field. The mix of tenured to un-tenured faculty, and the ranges of time-in-rank are good, the latter distribution suggests a very experienced department. There is diversity in the faculty with 3 women and 3 non-white/caucasian faculty members.

The self-study describes the workload as “manageable”. Given the target of around 50 graduate students and up to 200 undergraduates, it would seem that teaching and advising capacity might be rather stretched. The self-study does provide evidence of student satisfaction with advising. Faculty work load assignments are flexibly assigned with some faculty focusing on teaching while some are more research-focused. The department seems to manage it load requirements well.

Research
The self-study indicates a research-active department. It compares the external funding per faculty member to the national average using data from the Council for Chemical Research; based on this comparison the department exceeds the national average by at least 10%, and up to 60%.

The summary of publications shows an upward trend during the review period; peer reviewed publications have gone from 11 in 2005 to 28 in 2011. In the last two years of the review period 7 patents were issued.

Resources
Staffing: the department has support personnel typical for its size, including a full-time lab technician. Like many other OU departments the self-study points to the burden of time spent carrying out routine tasks such as ordering supplies, given the complexity of OU’s financial software systems. Clerical support and some of the lab technician’s time are allocated to, and paid by, funded research.
Physical Facilities: Faculty, staff, and instructional spaces are located either in Stocker or in the ARC and are reported as adequate. The department operates two laboratories for undergraduate instruction, which are maintained by the department lab technician.

Technology: Faculty office computers are provided by the department. The replacement cycle seems to be around 3 years which is adequate. Faculty acquire specialized computing resources through external funding. The department funds the operation of instructional labs at a level of $6000 per year, and reports charitable donations of $15,000 earmarked for repairs and improvements. During the review period state funding was used for lab upgrades and new equipment. Given changes in state funding since the self-study, this may become an area of concern in the future.

Educational Quality (Undergraduate Program)
The self-study reports an increase of full-time students in the program, from 60 students in 2004-2005, to 123 in 2009-2010. Graduates fluctuate between a low of 6 and a high of 15 per year during the review period. Over the final 5 years covered by the self-study, the number of new students enrolling increased from 11 to 37 per year. No analysis of these data are provided in the self-study; it does not explain whether these figures represent typical graduation rates for the discipline.

The self-study reveals a detailed outcomes assessment structure in place in the department. Core courses in the major are tied to program outcomes and goals; instructors submit “course reports” that evaluate the attainment of the goals. The department administers a “senior exit survey” which includes an in-person discussion. Finally, the department utilizes the “Career and Further Education” survey administered by Institutional Research, with department-specific questions inserted.

The self-study describes a deliberative process that utilizes these assessment data to select specific program outcomes for improvement. Examples of curricular changes in response to these evaluations are provided in the study.

Areas of Concern
The primary concern for this review is not the content of the self-study or the performance of the department; both are quite good. Rather, the review process used for the department’s undergraduate program, while well-intentioned, came up short in this instance.

Since the department goes through accreditation by ABET, it is reasonable to combine the internal UCC review with the external ABET evaluation. The reality of this combined review exposed several flaws. First, and least damaging, is the self-study itself. The department provided the data sent to ABET, along with an internal self-study that largely references the ABET document. This makes for awkward and disjointed reading, as the material is organized quite differently between the two. In the future, it may well be worth the extra work to copy-and-paste the relevant sections into the internal self-study.

Some of the delays in the completion of the review resulted from confusion over who could access and use the material. ABET tightly controls access to, and quotations from, materials it owns the copyright to. Similarly, OU puts use restrictions on the materials which it owns and sends to ABET. Miscommunication over the ownership and access restrictions of materials provided to UCC resulted in unnecessary delays; however, these can easily be avoided in the future.
The most serious shortcoming, however, results from the ABET accreditation response. Since use of that document is restricted by ABET, no quotes can be provided. In the end, that restriction is not really an issue as the portion of the response document provided to UCC amounts to little more than a “no problems found” finding. The intent in combining the internal and accreditation reviews is to have the accreditation process replace the external reviewers and site visits the UCC would otherwise utilize. If the accreditation body provides little to no content in its report, the value provided by the site visit is lost. While a reading of the self-study by an Ohio University faculty member can provide some insight, the context provided by experts in the subject area is missing, and interpretation of the data provided is of necessity incomplete.

Recommendations
Before the next review, the use of the accreditation process to replace the site visit and the use of external reviewers must be critically evaluated. It is essential that UCC receives an evaluation by external experts. If the accreditation process cannot provide this, the site visit may still need to take place. The data collection and preparation of the self-study, however, can still benefit from a combined approach.

We encourage the department to look at the graduation rates reported and ensure that these are within expectations for the discipline. (This is an example where the input from an external reviewer would be valuable). Along the same lines, the data provided shows a surprising number of recent graduates reporting “no current job”; this may again be normal for this field, but should be looked at and addressed if needed.

Commendations
The outcomes assessment and curriculum review process seems very well established, and will serve the students well. It is of special note that the department can point to specific curricular improvements that resulted directly from the assessment and review process. The continuation of the effort will certainly add value to the student experience and the quality of their education.
Review of Chemical Engineering (ChE), MS and PhD

Robert F. Savinell & Darrell Fawley, Reviewers

Recommendation: Viable

This review is based on a visit to the Russ College of Engineering and Technology on March 11 and 12th 2014. The review team met with the senior leadership of the department (Department Chair Prof. Valerie Young), Dean Irwin, graduate students from the College, tenured faculty, and probationary faculty. We also toured several laboratories in the college. In addition, we reviewed the program self-assessment and extracted data.

Faculty Profile

Current faculty size and distribution

Total of 11 faculty: Professors 6, Associate Professor 2, and Assistant Professor 3. The self-study only showed 9 CVs, so these numbers might not be accurate.

The faculty size is small considering the size of its graduate program, its research, and the increasing number of undergraduate majors.

Research, Scholarship, and Creative Activity

Current Department RSCA

The Department is well positioned and aligned with two of the three research focus areas of the School.

There are three groups with critical mass for a significant and impactful research (fuels, electrochemistry, corrosion) and these groups have high visibility in the field and a large number of interactions with industry.

The faculty has a strong publication record of 2-3 articles per year per faculty member. In addition, the faculty are active in presentations and posters at professional society meetings, averaging about 60 per year across the department faculty. Personal observations by one of the evaluators at AIChE and ECS national meetings report a strong OU presence not just of faculty at these meetings, but especially the presence of OU students.

External funding

The research funding was estimated at about $300k-$400/faculty member and is approaching the level of strong research universities ($400k-$450k/faculty member).

Resources (financial, space, personnel)
We did not hear from the constituents any significant concerns about financial resources, however it was pointed out that faculty need more administrative support in areas of program monitoring such as keeping track of graduate students progress towards degree.

**Educational Quality**

**Students**

PhD student recruiting is done largely by individual faculty member through individual contacts.

**Quantity**

The number of PhD students was estimated at 35 with 11 faculty members. The average of 3 PhD student/faculty compares well with highly rank Schools having 4-5 students per faculty member. The Department graduates about 4-5 PhD students per year, indicating a 6-7 year residence time for students to complete their degree. This estimate is likely not an accurate reflection of full-time student residence since there is a number of part-time PhD students in the corrosion research area.

The MS degree grants per year averages about 4 over the past 4-5 years. This is a small program, but likely important for creating vitality in the core courses and for feeding the PhD program.

**Quality**

The chair of the department recognizes the need to improve incoming PhD student quality. At this time recruiting is dependent on individual faculty contacts and efforts. Some faculty are requiring Skype interviews to enhance the selection process which should be commended. It is noteworthy that ChE graduate students have co-authored significant numbers of journal publications (60 out of 115 from 2005-2011) and conference presentations (65 out of 102 from 2005-2011). It is also noteworthy that OU graduate students have won various awards at national and international conferences.

**Diversity**

The self-assessment indicates that about 30% of the graduate students are female, which is very good in this field.

**Faculty Diversity**

The diversity of the faculty is commendable with 3 women and one Latino/Hispanic.

**Curriculum**

The required number of courses for the PhD is reasonable, as it is for the MS degree.

The department is aware of the critical need of students to have mastery of oral and written communications and has taken steps to strengthening these skills.

**Mentoring and advising of students**
From the student comments on the program, there was sufficient mentoring and advising of the students in the program.

Financial Support of graduate students

The stipend for full-time full-time PhD student of $19,100 is low for chemical engineering departments.

Teaching assessment

We did not review teaching evaluations. We received only positive statements from students.

Post graduation career placement

Placement of students reported in self-study indicates that there is a demand for graduates. OU graduates are recruited by large world-class companies.

Areas of Improvement

Research facilities of several of the major research groups within the department are spread across campus making interactions between and among students and faculty difficult.

The teaching load of the faculty is quite high for a department with significant research and PhD advising activity. PhD student advising activity and administrative duties with research centers and other beyond the normal administrative responsibilities should be accounted for in determining teaching loads.

The Department and School should consider a more formal mentoring and orientation program for new faculty, including training on budgeting, proposal writing, completing travel and other forms. The School should also consider strategies and plans to develop all faculty to their fullest potential including those with extended amount of time at the ranks of associate professor.

The number of PhD students per faculty member varies considerably between faculty from 0 for two faculty members, about 10 for one faculty member, about 20 for another, and 1-4 for the others. Although the average number of PhD students per faculty member and the research dollars per faculty member are at very competitive levels, the load imbalance creates significant risks of sustainability. In addition, the PhD student advising load is partially carried by faculty from other departments. The department should develop strategies to balance the research load through creating research clusters and use of mentors.

Recommendations

The department could benefit from a well-thought out strategic plan for growing the PhD program and its research support. Plans for growing the MS student population should be strategic and aligned to enhance faculty research productivity and PhD student graduation rates. We recommend this strategic plan include a clear pathway for increasing recruitment especially within the US since most US born students come from undergraduates programs within the University.

Chemical engineering will need continuous attention to replacing and growing the faculty.
Commendations

The faculty and students are highly engaged in graduate education and are enthusiastic about their research and professional involvement. We enjoyed meeting with the graduate students and the faculty during our visit.

The mini-dossier activity and annual evaluations seems to have significant value to keeping faculty on-target for tenure and promotion decisions.

Overall judgment: both the MS and the PhD programs are viable.
University Curriculum Council
Academic Program Review Committee

11-12 March 2014

Review of Biomedical Engineering (BME), MS

Robert Savinell & Darrell Fawley, Reviewers

Recommendation: Viable

This review is based on a visit to the Russ College of Engineering and Technology on March 11 and 12th 2014. The review team met with the senior leadership of the department (Department Chair Prof. Young and Program Director Prof. Goetz), Dean Irwin, graduate students from the College, tenured faculty, and probationary faculty. We also toured several laboratories in the college. In addition, we reviewed and extracted data from the program’s self-assessment.

Faculty Profile

Current faculty size and distribution

The BME MS Program is housed in the Chemical and Biomolecular Engineering department with a total of 11 faculty: 6 Professors, 2 Associate Professors and 3 Assistant Professors. The program also has faculty in other Russ College departments as well as three other Ohio University colleges.

The distribution of rank is reasonable as is the size of the faculty within the department. Since the program does use many faculty from other departments and colleges, much of the faculty is out of the program’s control.

Since this degree program is housed in the Chemical Engineering Department, many of the evaluation comments stated in the ChemE MS and PhD program evaluation are applicable.

Research, Scholarship, and Creative Activity

Current Department RSCA

As pointed out in the chemical engineering PhD and MS program evaluations, the department faculty have developed an active and scholarly research environment. The BME MS program surely benefits from this activity. In addition, students interact with faculty from other departments across the University.

External funding

The external funding is of the chemical engineering faculty is strong at $350-400/total faculty/year

Resources (financial, space, personnel)

We did not hear from the constituents significant concerns about financial resources.
**Educational Quality**

**Students**

Quantity - This program has vitality with 10-12 full-time students.

Quality – the quality of students are good. As pointed out below, more aggressive recruiting increased selectivity is recommended.

Diversity – The department did not present specific diversity numbers for this program. However, the department’s ratio of male to female students is 7:3. The department’s ratio of foreign/non-resident alien to white/Caucasian is just below 6:1. Students in the department’s programs come from North and South America, North Africa, Central and East Asia, Europe and the Caribbean. The department appears to lack diversity among its US-born population which is generally consistent with the University’s general student population.

**Faculty Diversity**

The faculty gender diversity of 27% female is within the expected range for Chemical and Biomolecular Engineering programs. The faculty consists of both native born and international faculty in typical proportions for Chemical and Biomolecular Engineering faculty. A future hire from an under represented group would improve the diversity of the department.

**Curriculum**

The curriculum of life science core courses, BME focus courses, electives, and level-c courses, along with a research experience gives a strong curriculum.

**Mentoring and advising of students**

No specific attributes or issues identified.

**Financial Support of graduate students**

Students receive an average of $16k for TA or GA positions and research assistants receive an average of $19k. A higher amount may improve the recruitment of students.

**Teaching assessment**

Did not review teaching evaluations. Did not talk to any BME graduate students.

**Post graduation career placement**

Students who graduate from the program receive jobs in many top companies, as well as government and academic settings.

**Areas of Improvement**
A large fraction of applicants are admitted to the program. More aggressive recruiting and more selectivity should help improve student quality.

The amount of faculty time and resources needed to support a thesis master’s degree has to be weighed against lost opportunities of expanding the PhD program (with research serving as the basis for enhancing reputation and rankings).

There is some concern about the availability of faculty for teaching the level-c courses.

**Recommendations**

- Increase recruiting, especially in the United States. Foreign recruitment seems to serve its purpose. However, a higher number of applicants will allow the program to be more selective in its admissions thereby increasing the quality.
- Seek a marketing budget from the University and use opportunities at conferences and speaking engagements to sell the program to potential students.

**Commendations**

The opportunities for 15-20 undergraduate affiliates give students a research experience and undoubtedly adds to the program vitality.

Graduates must write a thesis and generally publish once during their time in the program.

Student placement in industry seems to be strong and about half of the graduates go on for advanced studies. The program can use this in recruitment.

**Overall judgment: the program is viable.**