



**Executive Summary of Annual Report**  
**Richard and Bonnie Robbins Chair in Sustainable Use of Materials**  
**July 1, 2017-June 30, 2018**

Submitted by

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The duties of the Richard and Bonnie Robbins Chair in Sustainable Use of Materials are focused on the following set of activities. This executive summary will demonstrate progress in each of these areas.

**1. Provide leadership in research and teaching in sustainability and related areas, and offer at least one course per year**

As director of the Sustainable Futures Institute, I oversee the Graduate Certificate in Sustainability, which includes responsibilities for instruction in two of the required courses in this certificate. These courses include ENG4510-5510 Sustainable Futures 1 (SF1) and ENG5520 Sustainable Futures 2 (SF2). Enrollments in these courses has risen significantly over the last 5 years as shown in Figure 1, which shows historical enrollment data for both courses in sections for in-class as well as online students. These enrollment trends demonstrate strong interest by graduate students, and some undergraduate students as well, in multidisciplinary education

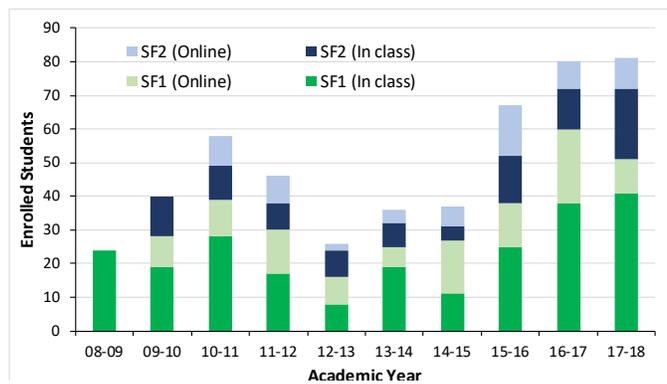


Figure 1. Historical enrollment data for core courses in the Graduate Certificate in Sustainability.

**2. Engage in sustainability-related research in institutes and centers as well as in the home department**

My research program focuses on chemical and biochemical process development for sustainable biofuels production from woody biomass (including logging and forest industry residues), municipal solid waste, and mixtures of food waste and animal manure. Sustainability assessments for these advanced biofuels include environmental life cycle assessments (LCA) and process techno-economic assessments (TEA). Our research is supported by domestic and international government and industry sponsors.

Major achievements from the research program in fiscal year 2017-2018 include the following student-focused outcomes;

PhD students sole-advised: (3, two have graduated, one expects to graduate Dec. 2018)

PhD students co-advised: (1, expects to graduate Dec. 2019)

Number of MS students advised or co-advised: (3, one graduated and continues as PhD student)  
 Number of undergraduate student research supervised: (8 chemical engineering students)  
 Number of alternative energy enterprise student supervised: (7 chemical engineering students)  
 Number of postdoctoral researchers sole-advised: (2, one assumed a faculty position at UND)  
 Refereed (ISI) Publications Published (9 in print)  
 Funded projects (6 funded research projects as PI or co-PI)

**3. Provide leadership in the development of major, successful interdisciplinary and multidisciplinary research proposals in sustainability**

- I led the campus effort to join three new DOE-funded Manufacturing USA Institutes and submitted 6 multi-disciplinary proposals to these institutes with a combined value of approximately \$3,000,000, with one project awarded (\$200,000 over 1 year).
- I participated as a co-investigator in a large multi-disciplinary sustainable engineering education proposal to the NSF IUSE program worth \$3,000,000

This past academic year I submitted 10 research proposals with combined value of \$1,697,696 in sponsor share and \$1,388,589 in cost share. Two have been funded so far with a couple of proposals remaining to be evaluated by the sponsoring agency.

**4. Mentor colleagues engaged in sustainability research**

I have mentored young faculty members, including Dr. Xinfeng Xie (SFRES) who I was chair of his Early Career Management Committee and with whom we submitted a (\$200,000) proposal to the Ford Motor Company; and Dr. Rebecca Ong (Chemical Engineering) with whom we submitted a \$500,000 proposal to the USDA. I mentor one Sr. Research Engineer, Dr. Robert Handler, the Operations Manager of the SFI.

**5. Work on establishment/growth of doctoral programs that accommodate sustainability-related research and graduate coursework:**

My work as director of the Sustainable Futures Institute is focused on developing large multi-disciplinary sustainability-related research and education proposals to external sponsors and taking leadership on the implementation of those projects. The SFI continues to be among a productive and impactful Center / Institute at Michigan Tech.

The annual Robbins Chair stipend was spent on the following categories shown in Figure 2. The vast majority of the funds were spent supporting graduate and undergraduate student research activities.

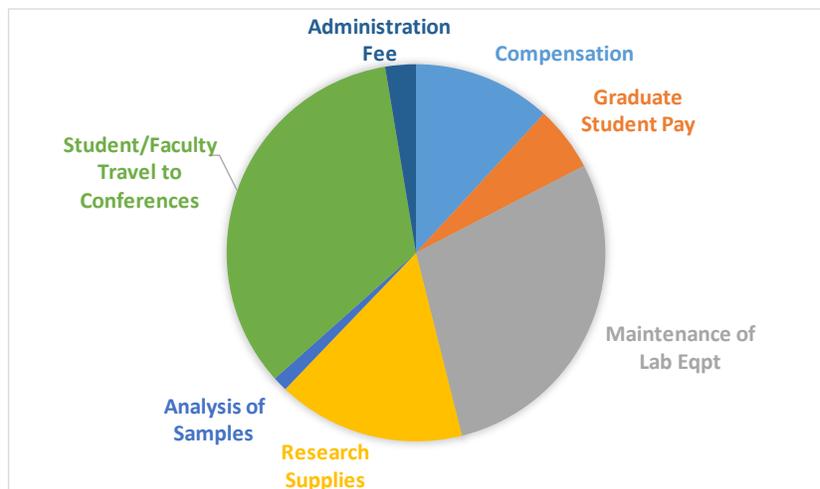


Figure 2. Robbins Chair account distribution of funds.