

UNIVERSITY COUNCIL
ACADEMIC PROGRAMS COMMITTEE
REQUEST FOR DECISION

PRESENTED BY: Roy Dobson, chair

DATE OF MEETING: November 20, 2014

SUBJECT: **Termination of the Bachelor of Science in Biological Engineering**

DECISION REQUESTED: *It is recommended:*

That Council approve the termination of the Bachelor of Science
Biological Engineering effective September 1, 2015

PURPOSE:

University Council approves the termination of academic programs.

DISCUSSION SUMMARY:

The Bachelor of Science in Biological Engineering program is considered a low enrolment program by the College of Engineering. Conversations about the future of the program have occurred since 1998. Despite suggestions to reinvigorate the program, most recently in 2010, no significant program changes were made and low program enrolment continued. At present, the three themes in the program can be offered more effectively through other means and still meet the needs of industry and students: Agricultural Machinery Design (or Biomechanical Systems Engineering) can be made available as an option in Mechanical Engineering; Natural Resources Engineering has already been co-opted to a large degree by the Environmental Engineering program; the courses comprising the Bioprocess Engineering theme will be continue to be offered by the Department of Chemical and Biological Engineering and could be offered by the department as an option among its program offerings.

Admissions to the program were suspended in March, 2013. The existing 11 students in the program are all in their fourth year. Program accreditation has been assured for the next two years.

The program has a long history in the college and university, being one of the oldest engineering programs at the university. Therefore there is some risk that the termination of the program as a foundational program will have a negative effect upon alumni graduating from the program. The college is aware of this risk.

REVIEW

The planning and priorities committee reviewed the program termination report form at its meeting on October 29th and provided feedback to the academic programs committee. The academic programs committee discussed the intended termination at its meeting on November 5th with Aaron Phoenix, acting associate dean, academic, College of Engineering in attendance.

ATTACHMENTS:

1. Covering memo and Report Form for Program Termination

INTEROFFICE MEMORANDUM

TO: DR. ALEX BELDAN, OFFICE OF THE UNIVERSITY SECRETARY
FROM: MR. CHRISTOPHER MARTIN, COLLEGE OF ENGINEERING
SUBJECT: UNIVERSITY SUBMISSION TO ACADEMIC PROGRAMS COMMITTEE OF COUNCIL
RE: TERMINATION OF THE BIOLOGICAL ENGINEERING PROGRAM

DATE: OCTOBER 3, 2014
CC: DR. GEORGES KIPOUROS, COLLEGE OF ENGINEERING
DR. AARON PHOENIX, COLLEGE OF ENGINEERING
MS. MEGHAN MCLAUGHLIN, COLLEGE OF ENGINEERING

Good afternoon Dr. Alex Beldan,

Thank you for taking the time to speak with me earlier this afternoon via telephone.

By way of this memorandum, and on behalf of the College of Engineering, I am requesting that the following motion be brought forth to the Academic Programs Committee of Council at the University of Saskatchewan:

BE IT MOVED that the University Council at the University of Saskatchewan terminate the undergraduate biological engineering program offered by the College of Engineering, effective September 2015.

To substantiate this motion, please find enclosed a copy of the *Report Form for Program Termination*, as well as associated documentation, for the Bachelors of Biological Engineering Program at the University of Saskatchewan.

Please note that this proposal was brought forth to the College of Engineering Faculty Council on May 13, 2014 and, following discussion, a motion was passed that supported the termination of the program at the college level.

Should you have any further questions or concerns, please do not hesitate to contact me directly via telephone (306-966-3201) or email (chris.martin@usask.ca).

Sincerely,

✠ Christopher Martin, B.B.A.
Academic Programs Coordinator
College of Engineering
Ph: (306) 966-3201



Program(s) to be deleted: Bachelor of Science in Engineering – Biological Engineering

Effective date of termination: September 2013

1. List reasons for termination and describe the background leading to this decision.

A Brief History of the Program

- 1909: Department of Agricultural Engineering formed with the College of Agriculture
- 1911: First courses of Agricultural Engineering offered
- 1925: First graduates from Agricultural Engineering
- 1932: Graduates were first recommended through the College of Engineering
- 1947: Department and program moved to the College of Engineering
- 1965: Program first accredited by the newly formed Canadian Accreditation Board
- 1993: Program and Department changed its name to Agricultural and Bioresource Engineering (ABE)
- 2010: Departmental merger with Chemical Engineering to become Department of Chemical and Biological Engineering
- 2010: Program name changed to Biological Engineering (BLE)
- 2013: Enrolment into second year of the program suspended
- 2013: Some faculty and staff members dispersed from Department of Chemical and Biological engineering to the Department of Civil and Geological Engineering or the Department of Mechanical Engineering

Because the BLE program by one name or another is one of the oldest programs offered by the University of Saskatchewan, this decision is not being made lightly.

Rationale for the Program Termination

Termination of the Biological Engineering program is being considered because the program, within the context of the College of Engineering, has a relatively low student demand while alternative, resource-efficient methods to train students in aspects of the biological engineering field can be developed. Termination of the program will allow reallocation of resources to support the delivery of our growing high demand programs and allow the creation of options to educate students in critical aspects of biological engineering within other programs.

The following subsections of the report describe (a) the trend of student numbers within the program, and (b) alternative, resource-efficient routes to educate students in critical aspects of biological engineering:

(a) *Student Numbers*

Prior to 2010, the Biological Engineering program (BLE) in the College of Engineering was known as the Agricultural and Bioresource Engineering program (ABE). Up until 2012, the program had three themes: **Agricultural Machinery Design (or Biomechanical Systems Engineering)**, **Natural Resources Engineering** and **Bioprocess Engineering**. Although not a large program, typically 10-35 students entered the ABE program each year. As shown in Table 1, the percentage of students choosing the ABE/BLE program ranges from a low of 2.9% in 1999-2000 to a high of 9.0% in 2006-07.

The student demand for the program is also reflected in Table 1 through the number of “First Choice ABE/BLE Students” entering the program. Students completing the common first year engineering program rank their preferred programs and are competitively placed into a program based upon their sessional weighted average. The difference between the “First Choice” column and the actual number of Year 2 students is, thus, an indication of the students who were placed in the program because they were not ranked high enough to obtain their first choice program. From 2006-07 to 2008-09, the majority of the students were not in the program because it was their preferred program.

In 2008, the College started offering an Environmental Engineering program (ENVE) where students could take their second year in either the ABE program, the Chemical Engineering program or the Civil Engineering program. This complex structure was difficult to administer and proved confusing to the students, and thus in 2010, administration of the ENVE program was placed within the Department of Civil and Geological Engineering. This caused the ENVE program to morph such that its recommended second year followed the Civil Engineering program and not the ABE/BLE program, and as shown in Table 1 the 2nd year enrolment in the BLE program dropped substantially from 32 students to 9 students. In short, many students who were interested in the Natural Resources Engineering stream chose to take the ENVE program. A reasonable demand by students for the program does not exist given the resources required to offer the BLE program in its current form.

In 2010-11, the College of Engineering created a task force to re-envision the BLE program. It envisioned a new program focusing on living systems and four focus areas: Bioresource utilization, ecosystem management/sustainability, human/animal health, and food. This proposal was reviewed by the existing faculty within the Department of Chemical and Biological Engineering and no significant program change was made. However the program did promote itself as a pre-med pathway, a change that had no impact on student numbers.

Low enrolment in the program continued, and in March 2013, the Dean of Engineering suspended enrolment into second year of the program. At the March 14, 2013 Faculty Council meeting, the Dean noted that there was concern expressed from the BLE students that the program was not delivering what they thought it would, an emphasis on biomedical engineering. As a result, there were a few students who requested to switch from BLE to another program in the middle of their second year.

Academic Year	ABE/BLE Year 2 Students	First Choice ABE/BLE Students	Total ENGG Year 2 Students	% of Students in Year 2
1997-98	24		307	7.8
1998-99	14		284	4.9
1999-00	8		273	2.9
2000-01	23		347	6.6
2001-02	20		325	6.2
2002-03	14	8	330	4.2
2003-04	15	8	328	4.6
2004-05	18	14	305	5.9
2005-06	31	17	355	8.7
2006-07	34	12	378	9.0
2007-08	27	13	334	8.1
2008-09	34	12	380	8.9
2009-10	32	9	422	7.6
2010-11	9	6	368	2.4
2011-12	13	11	367	3.5
2012-13	12	8	383	3.1

Table 1: Year 2 student headcount in Agricultural & Bioresource Engineering/Biological Engineering and the College of Engineering. (Data from College of Engineering internal statistics.)

(b) Alternative Biological Engineering Training

A flavor of the three traditional streams of the ABE/BLE program can be delivered by considering alternative programs and options within the existing engineering programs.

The **Natural Resources Engineering** theme, as mentioned earlier, is now being addressed by our Environmental Engineering program in a more comprehensive manner.

The **Agricultural Machinery Design** theme can be addressed by an Agricultural Machinery Option within the Mechanical Engineering Program. Initial drafts of this option are being considered at the Departmental level and while they may not be as in-depth as the BLE program, students who take the option will not only have knowledge of the impact of machines on biological systems, they will be employable as mechanical engineering graduates.

The **Bioprocess Engineering** theme is being considered as an option within the Chemical Engineering program.

These alternate ways to offer education within the three themes of Biological Engineering, although not implemented yet, will be a more efficient use of College resources. Resources can be redistributed to support the higher demand programs and increase the diversity of options available to students in these programs.

2. Technical information.

2.1 Courses offered in the program and faculty resources required for these courses.

The BLE program shares a common first year with all other engineering programs. A number of the upper year courses taken by the BLE students are from other departments in the College of Engineering or another College.

The BLE courses in the program are:

BLE212.3 - Physical Principles of Plant Biosystems
BLE275.3 – Applications in Precision Agriculture
*BLE295.3 – Introduction to Biosystems Engineering
*BLE311.3 – Mathematical Methods
*BLE312.3 – Electrical Power
BLE313.3 - Instrumentation
*BLE323.3 – Properties of Materials in Biosystems
*BLE324.3 – Mechanics of Materials in Biosystems
*BLE327.3 – Transport Processes in Biosystems
*BLE422.3 – Modelling of Biosystems
*BLE431.3 – Irrigation System Design
BLE432.3 – Soil and Water Conservation
*BLE441.3 – Design of Enclosed Environments
*BLE451.3 – Design of Agricultural Machinery Systems
*BLE462.3 – Biological Materials Handling
BLE475.3 – Off Highway Equipment Design
BLE481.3 – Sustainability and Environmental Assessment
*BLE482.3 – Waste Management and Utilization
*BLE495.6 – Design Capstone

There are 10 faculty associated with delivery of the program who are responsible for teaching the above courses as well as a number of general engineering courses, graduate courses and service courses to the College of Agriculture and Bioresources.

2.2 Other resources (staff, technology, physical resources, etc) used for this program.

There are two laboratory staff who assist in managing the undergraduate laboratories associated with this program. These staff members also assist in managing the graduate research labs for the BLE graduate programs, the undergraduate student group design space, the laboratory space used for the College of Agriculture and Bioresources service courses, and other important College activities.

2.3 Courses to be deleted, if any.

The Biological Engineering program shares many of its courses with other programs and provides service classes to the College of Agriculture and Bioresources. Therefore, not all courses related to the BLE program can be deleted. Those courses that will be deleted once all students currently in the BLE program have completed are marked with an “*” in Section 2.1.

2.4 Number of students presently enrolled.

There are currently 16 student enrolled in the Biological Engineering program. 7 in year 3 of the program and 9 in year 4 of the program.

2.5 Number of students enrolled and graduated over the last five years.

Table 1 below shows the number of students enrolled and graduated from the program since 2007-08. It should be noted that the enrolment into the 2nd year of the program was suspended for the 2013-14 academic year and that the number of graduates in 2013-14 is an anticipated number based upon the number of students who have applied to convocate.

Academic Year	Year 2 Students	Year 3 Students	Year 4 Students	Total Students in Program	Graduates
2007-08	27	26	24	77	22
2008-09	34	30	18	82	16
2009-10	32	17	23	72	20
2010-11	9	13	18	40	15
2011-12	13	10	13	36	11
2012-13	12	9	11	32	6
2013-14*	0	7	9	16	8**

* Enrolment into 2nd year of program suspended

** Applied to convocate

Table 2: Student headcount and graduates in Agricultural & Bioresource Engineering/Biological Engineering. (Data from College of Engineering internal statistics.)

3. Impact of the termination.

Internal

3.1 What if any impact will this termination have on undergraduate and graduate students? How will they be advised to complete their programs?

Students within the BLE program will be guaranteed that they will be able to finish their programs. Upper year BLE courses will continue to be offered until students have finished or a suitable alternative which does not impact the quality or nature of the program is identified. A critical class that can not be replaced is BLE 495.6 – Capstone Design.

3.2 What impact will this termination have on faculty and teaching assignments?

In July 2013, 7 faculty in the Department of Chemical and Biological Engineering closely affiliated with the BLE program requested transfers to other departments where the research and scholarly activity better matched their own activities. These requests were approved: 3 faculty transferred to the Department of Civil and Geological Engineering, and 4 transferred to the Department of Mechanical Engineering.

The Head of Chemical and Biological Engineering works closely with the other department heads to ensure that BLE courses have qualified instructors, and as courses in the BLE program no longer need to be offered, the BLE faculty have, and will continue to take on, teaching assignments within their home departments and within the College general engineering courses. These faculty are also recasting the content from BLE courses to create more electives within the Mechanical, Chemical, Civil, Geological and Environmental engineering program.

3.3 Will this termination affect other programs, departments or colleges?

BLE courses that are electives in other programs within the College of Engineering are not being deleted unless comparable classes within the College can be found. Those courses that have no equivalent will eventually be transferred from BLE to the most appropriate administrative home.

Specifically, courses within the BLE program that are electives or required courses in other engineering programs are:

BLE212.3 - Physical Principles of Plant Biosystems

- This is a required course in the ENVE program and is not a candidate for deletion at this time.

BLE275.3 – Applications in Precision Agriculture

- This is a service course offered to the College of Agriculture and Bioresources and will continue to be offered until negotiations with the College determine that the course is no longer required or an alternate method to offer it can be found.

BLE311.3 – Mathematical Methods

- This was a core course in the ENVE program and has not been replaced by CE 318. It is a candidate for deletion.

BLE312.3 – Electrical Power

- This was a core course in the ENVE program and an elective in the CHE program. It has been replaced by EE 204. It is a candidate for deletion.

BLE313.3 – Instrumentation

- This is a core course in the ENVE program and an elective in the ME program. It is not a candidate for deletion.

BLE432.3 – Soil and Water Conservation

- This is an elective course in the ENVE program and is a candidate to be adopted by the ENVE program within the Department of Civil and Geological Engineering.

BLE475.3 – Off Highway Equipment Design

- This is an elective in the ME program. It is a candidate to be adopted by the ME program within the Department of Mechanical Engineering.

BLE481.3 – Sustainability and Environmental Assessment

- This is an elective in the Civil, Environmental and Geological Engineering programs. It is a candidate to be adopted by the ENVE program in the Department of Civil and Geological Engineering.

It is important to emphasize that the BLE program has a strong connection with the College of Agriculture and Bioresources through the service courses it offers to that College's Agriculture Diploma programs. No deletions of service classes will be considered without due consultation

with the College of Agriculture and Bioresources. A letter of support from the Associate Dean (Academic) in the College of Agriculture and Bioresources has been appended to this proposal.

3.4 If courses are also to be deleted, will these deletions affect any other programs?

See the response in section 3.3.

3.5 Is it likely, or appropriate, that another department or college will develop a program to replace this one?

It is unlikely that another department or college will develop a biological engineering program.

3.6 Is it likely, or appropriate, that another department or college will develop courses to replace the ones deleted?

As mentioned in section 1, it is highly likely that the Department of Mechanical Engineering will put together an Agricultural Machinery Option in order to better train students to meet the needs of the agricultural machinery sector. It is also likely that the Department of Chemical and Biological Engineering will develop electives that would contribute to a Bioprocessing Option within the Chemical Engineering Program.

3.7 Describe any impact on research projects.

Faculty will continue to pursue research related to the Biological Engineering Field. This should not impact the BLE graduate programming.

3.8 Will this deletion affect resource areas such as library resources, physical facilities, and information technology?

Faculty laboratory space will be unaffected. Classroom and undergraduate laboratory space associated with the deleted BLE courses will be repurposed to support other undergraduate teaching needs.

3.9 Describe the budgetary implications of this deletion.

There was a downsizing of technical support staff and administrative staff due to workforce planning in 2012-13. There is no further anticipated reduction of faculty or staff due to the deletion of this program or its courses. However, faculty who remain will be able to teach courses within other programs, teach general engineering courses, or offer new elective courses in other programs, adding breadth to these programs.

There will be a minor cost savings associated with the labs in some of the deleted courses.

External

3.10 Describe any external impact (e.g. university reputation, accreditation, other institutions, high schools, community organizations, professional bodies).

A 2010 InSightrix survey of AB/ABE/BLE alumni and industry indicated that the alumni and the local agricultural machinery industry think very highly of the program. The survey also found

that the local agricultural machinery industries also think very highly of the graduates of the program. Deletion of the program may hurt relationships with alumni of the program and may have a short term detrimental impact on the College's reputation with the agricultural machinery sector until the Agricultural Machinery Option in Mechanical Engineering has established itself.

3.11 Is it likely or appropriate that another educational institution will offer this program if it is deleted at the University of Saskatchewan?

It is unlikely that another educational institution will offer the BLE program. The closest related program is currently being offered at the University of Manitoba.

Other

3.12 Are there any other relevant impacts or considerations?

The BLE program is currently accredited by the Canadian Engineering Accreditation Board (CEAB) until June 30, 2015. If the program is terminated, a Notice of Significant Change will be submitted to the CEAB notifying them of the termination and requesting a one-year extension to the accreditation to allow the students in the program to graduate with the full rights and privileges of an accredited degree.

3.13 Please provide any statements or opinions received about this termination.

Attached: May 5, 2014, Letter of support from Dr. Murray Drew, Associate Dean (Academic), College of Agriculture and Bioresources.

Attached: May 1, 2014, Email from Jeff Toppings, Vice-President Student-Affairs, Saskatoon Engineering Society. This email summarizes the input Mr. Toppings received from the current biological engineering representative and four other biological engineering students.

(Optional)

4. Additional information. *Programs which have not undergone recent formal reviews should provide additional relevant information about quality, demand, efficiency, unique features, and relevance to the province.*



UNIVERSITY OF
SASKATCHEWAN

College of Agriculture
and Bioresources



TO: Aaron Phoenix, Associate Dean (Academic)
College of Engineering

FROM: Murray Drew, Associate Dean (Academic)
College of Agriculture and Bioresources

Date: May 5, 2014

Re: Termination of the Biological Engineering Program

The College of Agriculture and Bioresources supports the termination of the Biological Engineering Program in College of Engineering. The primary interaction AgBio has with the Biological Engineering program is the 6 courses it provides for our students: BLE 205, 261, 275, 303, 307 and 309. These courses are valuable restricted electives in our programs and we appreciate the effort that Engineering has made to deliver these courses. With the restructuring of the departments in Engineering, there will be changes in the delivery of these courses.

In consultations between our Colleges we have concluded that Engineering will continue to provide BLE 205 (Agricultural Machinery Management), BLE 303 (Principles of Food and Bioproducts Engineering) and BLE 307 (Agricultural Building Systems). AgBio will take over the delivery of BLE 261 (Post Harvest Management of Agricultural Crops) through the development of a new course. We have the faculty expertise and appropriate facilities such as the Canadian Feed Resources Centre to deliver such a course. Thus, offering this course in our College makes economic and disciplinary sense.

Two courses will be eliminated: BLE 275 (Precision Agriculture) and BLE 309 (Water Management). Enrolment in these courses has historically been low (between 10 and 20 students), thus, the elimination of these courses will affect few students and reduce program costs. Furthermore, there may be opportunity in the future, to develop replacement courses with other academic units on campus such as the Water Institute.

In conclusion, the College of Agriculture and Bioresources supports the reorganization of the College of Engineering and will continue to work with them to provide programming for our undergraduate students.

Sincerely

A handwritten signature in blue ink, appearing to read 'Murray Drew'.

Murray Drew, Ph.D.

Associate Dean (Academic)

Phoenix, Aaron

From: SESS VP Student Affairs <vp.student-affairs@sess.usask.ca>
Sent: May 1, 2014 3:11 PM
To: Phoenix, Aaron
Subject: BLE Feedback

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Aaron Action Required

Hi Dr. Phoenix,

I met with the BLE student rep as well as four other BLE undergraduates. Here are the main points that they had:

Concerns:

- BLE is a great program, but has been very poorly advertised.
- When the program name was changed from Agriculture and Bioresources Engineering to Biological Engineering, many students were unsure what the program was all about. The name "Biological Engineering" is very broad, and doesn't reflect the program as well as the AgBio title did
- One of the BLE undergraduates said that when searching for jobs, he refers to himself as an Agricultural Engineering student, as not many people in industry know what Biological Engineering is
- Many students came into the BLE program thinking that there would be Medical/Biomedical Engineering options within. This was not the case, so many BLE students ended up transferring to a different discipline at the end of their second year.
- Current BLE engineers have an aging population, so there are many jobs beginning to open up in this field.
- When the Environmental Engineering program was created, many students chose this discipline over BLE. BLE and ENVE are fairly similar, but the majority of students chose ENVE as the name of the program was much more specific to their interests.
- Currently, the major agricultural manufacturing companies in Saskatchewan really like to hire Biological Engineering Students from the U of S. If the BLE program is terminated, they plan to hire many out of province engineers, rather than U of S Mechanical Engineering students.
- Some industries are willing to help fund the BLE program, but there are major communication gaps.

Agricultural Machinery Option:

- The BLE undergraduates were all in favour of creating an Agricultural Machinery Option with the Mechanical Engineering Program.
- There are plenty of useful resources for use if this type of program was created.
- Many companies are looking for Mechanical Engineering students with a background in farming.
- Lots of Mechanical Engineering students are currently having difficulty finding jobs. The Agricultural Machinery Option would give these students some extra education that would be very useful if they were looking for a job in the Agricultural side of Mechanical Engineering.

Bioprocessing Option:

- There would be a large industry demand for a bioprocessing option. However, there may not be as much interest in this type of program.
- A lot of bioprocessing engineering is needed in industry, particularly in food processing plants.

-All of the undergraduates were in favour of the creation of a bioprocessing option.

The main point that the students emphasized was when the name of the program was changed to Biological Engineering, the program was not branded particularly well and it did not draw the interest of students.

If there is anything that I missed or anything else that you would like me to clarify, feel free to contact me.

Regards,
Jeff Toppings

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Vice-President Student-Affairs
Saskatoon Engineering Students' Society

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