Western University
School of Biomedical Engineering

Undergraduate Program Handbook

September 2024

Welcome from the Undergraduate Program Committee

The School of Biomedical Engineering (SBME) and the Undergraduate Program Committee wish to welcome you to the Biomedical Engineering undergraduate program. Your program is designed to be taken as a five-year concurrent degree which includes a degree in a core engineering discipline. More information about your program can be obtained at our website https://www.eng.uwo.ca/biomed/undergraduate/index.html

See the Western Calendar for up-to-date details on modules, academic progression, and prerequisites.

Program Administration

The following is a list of contacts:

- Rebecca Norman (Program Assistant), bmeoffice@uwo.ca
- Dr. Emily Lalone (Program Chair), emily.lalone@uwo.ca
- Dr. James Lacefield (SBME Director), jlacefie@uwo.ca

Your questions should first be directed to:
Rebecca Norman
bmeoffice@uwo.ca
661-2111 ext. 86739

The SBME offices are located at Amit Chakma Engineering Building, Room ACEB2405.

Academic Counselling

Academic counsellors are available to guide you in matters that include:

- Having trouble enrolling in a course.
- Requiring special permission to take a course.
- Intent to take a course that is not listed in your progression sheet.
- Having questions about meeting requirements of your concurrent degree.
- Being not sure if you are progressing correctly through each year of your degree.
- Intent to take a course in a sequence different from your degree progression sheet.

For guidance with those and other questions, you can contact your academic counsellor at https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/academic-counselling.html

In Year 2

You should be enrolled in BME 3201A/B Fundamentals of Biomedical Engineering Design. This is NOT automatic and you should confirm that you are enrolled as you are not yet registered in the BME Concurrent Degree Program. You will need to obtain a 70% in BME 3201A/B and maintain good standing in order to qualify for being registered in BME. If you pass BME 3201A/B, but you did not qualify for BME or you decide not to enter BME, then you can use BME 3201A/B as a 0.5 credit technical elective in your core discipline degree. The BME Admissions page has more information.

Course Requirements and Degree Progression

Progressing through your 5-year concurrent degree requires you to take certain courses, with some choices provided in lists of elective courses.

You must enroll in the courses yourself, since generally you will not be enrolled automatically.

For a detailed list of courses to be taken each year, you should reference the Progression Sheet that is specific to your Concurrent Degree program:

- Chemical Engineering and Biomedical Engineering
- Electrical Engineering and Biomedical Engineering
- Mechanical Engineering and Biomedical Engineering
- Mechatronic Systems Engineering and Biomedical Engineering

*You should **NOT** follow the progression sheet of your base degree program. You should follow only the progression sheet for your BME concurrent degree program.*
Note the term "… and Biomedical Engineering" that must appear on your Progression Sheet. Also be careful to follow the Progression Sheet that corresponds to the year you started Undergraduate Engineering (Year 1).
You can find your Progression Sheet at: https://www.eng.uwo.ca/undergraduate/upper-year/next.html

Alternative Progression Strategies

Biology Courses

The Biology courses (Biol 1001A and Biol 1002B) must be taken in Year 3 or earlier in order to satisfy pre-requisites in many of the Biomedical Science elective courses. These two Biology courses are also offered during the summer, so you might choose to take one or both in the summer before Year 3 if you want to reduce your term workload or move a later course into Year 3. Planning to delay one or both of these two Biology courses until the summer after Year 3 would be too risky, because they usually fill to capacity.

Upper Year Strategies

Year 4 can be busy with a heavy workload. It is possible to delay one or two electives to the following year, as Year 5 is less busy due to the BME Research Project (BME 4400) and Capstone

courses. You may also decide to take your Capstone course in Year 4, which would allow you to partner with your cohort peers of your base degree program.

BME Research Project – BME 4400

In year 5, you will take BME 4400, which is a major independent research project in biomedical engineering performed in collaboration with a faculty supervisor. You are highly encouraged to begin your research project in the summer between years 4 and 5, which means that you should seek a faculty supervisor working in a research area of your interest. The supervisor can be any Western professor and their laboratory can be either on campus or at one of Western's affiliate hospitals or research institutes across the city. One way to find professors is to look at their Western faculty web page. Here are links to research faculty lists in BME's affiliate faculties:
https://www.eng.uwo.ca/biomed/research/index.html
https://www.eng.uwo.ca/research/index.html
https://www.schulich.uwo.ca/research/
https://www.uwo.ca/sci/research/index.html
https://uwo.ca/fhs//research/index.html
https://www.lawsonresearch.ca/
https://www.robarts.ca/
https://www.uwo.ca/bmi/research/index.html
https://boneandjoint.uwo.ca/index.html
https://win.uwo.ca/

Summer Research/Work (Requirements and Recommendations)

It is a **requirement** that you spend at least one summer gaining practical experience that is relevant to biomedical engineering; this can be accomplished through a summer research project or a co-op or other position at a medical device company or in a related industry. Any exceptions to this requirement must be approved by the undergrad chair **before** the summer after Year 4, in order to provide enough time to ensure that you have a suitable summer research project topic for BME 4400.

It is **recommended** that the BME experience happens during the summer after Year 4 so that you can make use of the knowledge gained during the BME cohort year.

External (out of town) Supervised Research Projects

It is possible to conduct a summer research project at an institution outside of London with a research supervisor at a different university. This may be a good option, especially if the university is in your hometown where you will spend the summer. If you wish to explore this option, then you will need to seek potential researchers at that institution's website. The BME 4400 instructor might be able to assist you. This option must be approved by the BME 4400 instructor before you are permitted to use an external summer project as the subject of your BME Research Thesis in BME 4400. Before approval can be granted, you will be required to submit a project description and a plan to fulfill the BME 4400 course deliverables upon their normal due dates. With this option, you would complete your experimental data collection

during the summer prior to BME 4400, and then during the fall-winter terms, you would continue working on your project conducting data analysis and report writing with your external supervisor's continued involvement. However, all grading and assessments would be the BME 4400 instructor's responsibility. Returning to the external laboratory throughout the fall-winter terms (especially reading week) would be encouraged. Note that there is no Western Engineering funding or scholarships available for projects with external supervisors. Thus, you will need to seek funding from the external supervisor if necessary.

If you desire help connecting with a faculty supervisor, then Dr. Emily Lalone emily.lalone@uwo.ca can assist you.

Industry Funded Projects

It is possible for your research project to be conducted at an industry location, or for it to be funded by an industry partner. The industry contact might be initiated by you or by a faculty supervisor. In any case, all industry projects must still be supervised by a Western professor.

Summer Funding Awards

You might qualify to receive a summer research funding award to at least partially you're your summer salary. You can find more information at the Undergraduate Summer Research Award page, where you will also find some potential projects listed by supervisors who are looking for students.

Courses Outside Engineering

Elective Course Lists

The lists of elective courses indicate the courses outside of Engineering that are available to you. However, the lists are not split up by year, so it is possible for you to be considering an elective course for which you do not yet have the required pre-requisites. You must look up the pre-requisites and make your choices accordingly.

Scheduling Conflicts

If you desire to take an elective course but it conflicts with the schedule of a core course, then you will need special permission, which your academic counsellor can help you arrange.

Taking Electives Outside of Their Suggested Terms

For some electives listed, the above situation cannot be avoided. For example, Biochem 3385A requires pre-requisite Biochem 2280A; however, your progression sheet might list your only Biomedical Science elective in the same term as Biochem 2280A. Thus, unless you took Biochem 2280A previously, then you are not able to take Biochem 3385A in the same term as Biochem 2280A. If you really want to take Biochem 3385A, then you may choose to take a core Engineering elective instead in Year 4, and then take Biochem 3385A in Year 5. In general, you may take electives in years that are different from the ones suggested on your progression sheet, as long as in the end, you have taken the required number of electives in each category. For example, you cannot replace a Biomedical Science elective with an Engineering elective.

Scheduling Non-Technical Electives

Your program may include a non-technical elective (NTE) in either Year 2 or Year 3. If so, then the NTE appears in a specific Term A or B. You are permitted to take the NTE in the other term (of the same year) where it is not listed, if the course you are most interested in is only offered then. However, if you don't have a strong preference about a specific course, then you are advised to take the NTE in the term it is listed in order to balance workload.

When selecting an NTE in Year 2 or 3, you are advised to plan ahead for the healthcare non-technical electives that interest you for Year 4. If one of your preferred healthcare non-technical electives has a prerequisite, you should take the prerequisite course as your Year 2 or 3 NTE.

Enrolling in Elective Courses

Many of these courses have prerequisites or registration priorities that are not part of the BME program, but if a course is listed as an approved elective, the School of Biomedical Engineering has negotiated equivalent prerequisites and/or registration priority with the Faculty or Department offering the course. To register for one of these courses, you must inform your academic counsellor or Dr. Emily Lalone of your intention to take it at least one week prior to the beginning of your registration window so that we can arrange special permissions for you to register. You will then have to call the Student Center Helpdesk during your window to register for that course.

As illustrative examples, the negotiated prerequisite for BME students to take Physics 4662A/B - Magnetic Resonance Imaging, is ECE 3336A/B. Since this is not official prerequisites for those courses, you will still require special permission to register even though you have completed the negotiated BME-specific prerequisite.

Specific Elective Courses

The following information on elective courses is more current than your progression sheet. If you have questions about a specific elective course, then you can search this document for the course code to find instructions.

Biology Courses: Courses BIOL 1201A and BIOL 1202B have been discontinued and replaced with Biol 1001A and Biol 1002B, respectively. Thus, BIOL 1201A is interchangeable with BIOL 1001A. BIOL 1202B is interchangeable with BIOL 1002B. You may also choose to take BIOL 1001A in the summer before Year 3 (and optionally also BIOL 1002B) in order to reduce your Year 3 workload.

Biology 2382, Biology 2581, and Heath Sciences 2300 are among the more popular biomedical science electives that require special permissions to be arranged in advance. Space is limited.

Organic Chemistry: The Chemistry department will not waive the Chem 1301 prerequisite for Chem 2213. So, you need to plan in advance to fit in Chem 1301 if you wish to take Organic Chemistry.

Healthcare NTEs: There are no special arrangements for BME students taking the healthcare non-

technical electives. You should expect the programs offering those courses to treat you the same as any other Engineering student wanting to enroll.

PSYCHOL 2036 and PSYCHOL 2135 (approved June 30, 2021)

PHARMACOL 2060 is not available to BME students.

History 2819G or the similar History 2818F/G have been approved. However, be advised that these are essay courses, which are generally more work than A/B courses.

Other Things to Know

Writing 2130F/G: A common question is regarding the Writing 2130F/G course that exists in each base engineering degree but does not exist in the concurrent degree with BME. This is because BME has enough Complementary Studies credits to satisfy the accreditation requirements of your base Engineering degree without the need for an additional Writing course. NOTE: If at any time, you decide to leave the BME program or you drop out, then your other base Engineering program will have to assess whether you have completed enough Complementary Studies credits. If not, then you will likely have to take the Writing course in order to satisfy your base Engineering degree requirements.