2. Curriculum Review

2.1. Pathways for Graduates

Pathways to Employment

What kind of occupations are your graduates prepared to pursue?

When designing the program, the expectation was that it would provide a broad education in physics and technology that would allow graduates to pursue scientific and technical roles in the technology sector (in areas such as green energy technology, robotics, industrial process control, and electronics). It was also envisaged that graduates would be prepared to pursue teacher training as well as more business-oriented roles such as technical sales. Now that PMT students have secured work experience positions during the program and full-time jobs after graduation, there are concrete examples of where the program can lead. (See also the Career Pathways Map in Appendix C.)

For their work experience, which takes place at the end of third year, students have secured positions in areas such as robotics, green energy technology, manufacturing engineering, biomedical engineering, software development, physics research, particle accelerator technology, satellite image analysis, optics, agricultural technology, and electronics. Students' roles in those areas have included: assembling, testing, and calibrating products (hardware and software); computer programming; building and testing electronic circuits and optical setups; performing experiments; analyzing data; refining manufacturing procedures. Some students have also gained experience in the area of sales and marketing. After graduating, several students have been offered positions at the company where they did their work experience.

PMT graduates are working in the following areas: scientific camera development; software; scientific research; particle accelerator technology; biomedical engineering; mining technology; electric power supply and management. Job titles of the PMT graduates include: Product Manager; Software Developer; Junior Data Scientist; Hardware Systems Technician; Service Engineer; Biomedical Engineering Technologist; Assembler; Engineering Technologist; Electromechanical Technician.

How are you preparing your graduates for jobs in this field, future changes in this field, and the job market in general?

Preparation for jobs in the technology sector has been the focus of the PMT program from the beginning. The first step in designing the degree was consultation with local companies to determine the type of content that would be useful. This consultation is ongoing through the PAC. Feedback on the usefulness of program content is also received from students when they complete their work experience and from graduates who are employed in the sector.

Specific hands-on technical skills and topics relevant to the technology sector that are taught in the program include electronics, programming, experimental design, process control, sensors & actuators, applied optics, signal & image processing, and analytical chemistry. As noted in the previous chapter, programming is an area that could be improved. Also, there may be a desire to re-examine the range and scope of chemistry needed for the program.

In addition to technical skills, development of students' soft skills is also very important in preparing them for the workforce. To that end, written and oral communication skills are developed in many courses through activities such as report writing, presentations, and teamwork. Recognizing the need for these communication skills to be further developed, this year's offering of our Special Topics was on the topic of communication. The results of this program review will be used to help determine the extent to which communication skills should be incorporated in the program on an ongoing basis.

When designing the program, feedback from employers was that technology graduates are generally lacking in business skills, which are important for many jobs in industry. To help address that, the program contains two business courses. The mandatory work experience at the end of students' third year also helps to prepare them for their future careers. As stated in our Full Program Proposal, the benefits of work experience include "(i) students seeing the relevance of their studies to the workplace, (ii) students gaining valuable experience of the "real world" of employment, and (iii) students making contacts that will serve them well when they look for employment after graduation."

The PMT program helps prepare students for future changes in the field in a number of ways. Although technology may change quite rapidly on the surface, the science underlying modern technology changes much more slowly. Courses such as Classical Mechanics, Thermal Physics, Electricity & Magnetism, Quantum Mechanics, and Solid State Physics, ensure that PMT graduates have a sound grasp of the fundamental science underlying much of modern technology and are therefore equipped to understand and learn about new technologies as they emerge. The PMT program encourages independent learning and thought, which is also important when dealing with changes in the field. For example, in Experimental Physics in second year, students must design and perform their own experiments, as well as learn about topics that are not necessarily directly covered in their lecture courses. This ability is developed further in the 3rd and 4th year projects, in which students carry out extended one-semester and two-semester projects. This requires independent research of the project topic and also often requires students to learn new skills. Such abilities are critical for any employee who needs to keep up with changes in their field of employment.

Are there professional competencies that your graduates require for entry to the profession?

PMT graduates do not require specific professional competencies as set out by an accreditation agency in order to secure the types of position described above.

There is no external accreditation of physics degrees in Canada. As noted previously, the Canadian Association of Physicists does have a Professional Physicist (P.Phys.) designation that our graduates can apply for after three years of physics-related work experience. Although this designation is not required for physicists to work in industry, it is possible that it will help PMT graduates advance in their careers if it becomes more widely recognized.

Are your graduates ready to take on entry level positions only, or are you preparing them in the medium or long-term for leadership roles?

So far, PMT graduates have secured entry-level positions. However, some have advanced to higher levels a couple of years after graduating. In addition, some graduates are planning to pursue further education

(e.g. MBA) to accelerate the advancement of their careers. The alumni survey will give more detailed information on the PMT graduates' career paths.

It is hoped that the students' experience in the PMT program will help them as they progress in their careers to more senior roles. In addition to the scientific and technical knowledge that would be important in a senior role in the technology sector, one also hopes that the graduates' problem-solving ability and communication skills will help them as they progress. The alumni survey that will be administered later in the program review process may help identify ways to further help in that regard.

In a competitive employment market, what kinds of experiential education are employers looking for?

The primary experiential learning component of the PMT program is the work experience that students complete at the end of their third year. Although such experience is sought by employers, some members of our PAC have indicated that longer work terms (e.g. 8 months) are more desirable as it gives more time for the student to do meaningful work after the initial training period. Currently the PMT program is structured so that students can do work experience of up to five months' duration. This program review will help inform whether/how to reform the work experience component of the program.

Feedback from the PAC suggests that employers value the experiential learning that the 3rd and 4th year student projects provide. In addition to the specific scientific and/or technical aspects of the projects, PAC members have expressed the importance of development of project management skills, which is now a focus of the first semester of the 4th year project. PAC members also value student projects that are done in collaboration with companies. Some students have been involved in such projects, both as part of their 3rd and 4th year projects and as extracurricular activities.

Will your students be well prepared to keep up with the changing knowledge base of their field?

As discussed above, the PMT program helps in various ways to prepare students to navigate changes in their field of employment. Hopefully this program review will provide further understanding of this aspect of the students' preparation for the workforce.

Pathways to Further Study

Is your program intended to be, in most cases, the terminal program in a student's educational experience, or do you typically expect them to take another program of study?

Since its primary goal is for graduates to find employment in the technology sector, the PMT program is designed so that it can be the terminal program in a student's educational experience. However, as discussed below, options for further study are available to students after they graduate. See also the Career Pathways Map in Appendix C.

Does, or should, your program ladder into another credential at KPU or elsewhere? To what extent are your courses transferable to other programs at KPU or elsewhere?

The program is not designed to directly ladder into other programs. As shown in Figure 1 (Chapter 1), our first-year courses are highly transferrable to other BC institutions. Also, as discussed below and in the previous chapter, transferring to graduate programs at other institutions is possible.

BSc degrees at KPU have a significant amount of overlap in their first year. Students who decide to switch programs after (or during) their first year will therefore have already completed a sizable fraction of the first-year courses.

The first year of our program contains five of the Engineering Certificate's courses, so transfer between the two programs is possible.

Does, or should, your program provide prerequisite courses that allow students to apply, on graduation, for a professional program (such as teacher education)?

As written in the Full Program Proposal: "We believe graduates of our program will be exceptionally well prepared for entry into teacher preparation programs for secondary school science teaching. The program provides a combination of theoretical understanding at a level that appropriately exceeds that required in high schools and practical skills that supports the teacher's work. After the appropriate teacher-training, the more obvious areas of expertise include physics, math, electronics and information & communications technology."

None of the PMT graduates so far has pursued this route. However, one should connect with local teacher preparation programs to confirm that PMT graduates are eligible for admission.

Some of the PMT alumni who are currently employed are planning to register in (or have started) MBA programs. Their analytical and communication skills, along with the business content of the PMT program, will help them in pursuing this route.

Is a graduate of your program well prepared for study at the next level? Is, for instance, a baccalaureate graduate prepared for graduate school should they choose to pursue it?

Although preparing students for graduate studies is not the primary goal of the program, it is desirable to make sure that laddering into graduate school is an option for our graduates. To that end, several years ago the Physics Department reached an understanding with the graduate chair of the SFU physics department on how PMT graduates could become eligible for entry to SFU's graduate program. It involves completion of three additional fourth year theoretical physics courses at SFU. So far, two PMT graduates have pursued that route. The Department has also reached out to UBC, and they have indicated that they encourage applications from PMT students.

Laddering directly into graduate programs outside Canada is possible. One of the recent graduates was accepted into the MSc in Fusion Energy at the University of York in the UK (though chose to accept a job at a BC tech company instead of pursuing the MSc).

The experience of faculty at similar European BSc programs is that their graduates fare very well in graduate school. For example, a graduate of a highly applied and hands-on physics degree is well-prepared for research in laboratory-based experimental physics.

Pathways to an Enriched Civic and Personal Life

How well does your program curriculum develop skills an educated citizen should have?

By the end of the program, students will have a high level of numeracy and a deep knowledge of physics. They will have honed their skills in course work, scholarly research in their projects, and in their work experience. These skills are transferrable and will allow our graduates to evaluate complex issues by looking deep into the data and drawing their own conclusions. The program puts emphasis on communication so they will have the ability to present their findings and opinions in a clear, coherent manner in writing and in public. During the program, students develop the ability to read and understand complex texts and documents, which will serve them well in keeping up to date with, and understanding, many of the major issues facing our society. PMT students will be able to engage in the discussion of complex issues, not just follow them.

As the program name Physics for Modern Technology suggests, PMT students will have acquired a deep appreciation of the new technologies that pervade daily life and will be equipped to put those technologies to work in new and creative ways for their own benefit and the benefit of society. It will also allow the students to better understand the potential and the limitations of new technologies.

Finally, the program makes it clear that there is always more to know. Research and project courses give the students the skills to control their own learning and not to rely on their instructors.

Does your program help students to make more informed decisions in their personal and civic lives?

As mentioned above, numeracy, a sophisticated knowledge of physics and technology, the practice of scholarly research, examining data and drawing conclusions, synthesizing research findings, and being able to present and discuss those findings are skills that can be used in many areas of their personal and civic lives. If the students wish to make informed decisions, they will have the problem-solving skills to do so in many areas.

Does your program equip students with new, or deepened literacies – be they digital, oral, written, etc.?

PMT students acquire and use a wide range of mathematical, scientific, and technical knowledge. Numeracy, an often-overlooked literacy, is at the heart of the physical sciences. Combined with a deep knowledge of physics, numerical data, equations, and charts become a way to read and represent the world around us.

Since the program emphasizes communication skills, the students will have had experience translating complex ideas and technical knowledge into more accessible language. To be truly literate, one must be able to discuss topics on many different levels.