DESIGNING CONTEXT-RESPONSIVE UNDERGRADUATE RESEARCH PROGRAMS: A CANADIAN–UGANDAN ENGINEERING EDUCATION PARTNERSHIP

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Abstract – *Undergraduate research experiences (UREs) are recognized as high-impact educational practices in engineering, yet implementation in resource-constrained settings presents unique challenges. This paper documents the co-design and initial implementation of the Biomedical Engineering Research and Entrepreneurship Program at Mbarara University of Science and Technology (MUST), Uganda, in partnership with Canadian faculty through Academics Without Borders. The program integrates core research competencies across the curriculum, culminating in a certificate pathway for senior students. Program design emphasized scaffolded skill development, modular integration into existing courses, and faculty-led adaptation to ensure sustainability and institutional ownership. Responses from student, faculty, and industry questionnaires informed program structure and identified gaps in research preparedness and local industrial capacity. Ongoing work focuses on mixed-methods evaluation and longitudinal tracking. The initiative provides a practical model for embedding undergraduate research in contexts with limited infrastructure, balancing scalability, flexibility, and alignment with local institutional priorities.*

Paper Type: Educational Practice

Keywords: Undergraduate research; Engineering curriculum; Research skill development; Program design; International collaboration

1. INTRODUCTION

Undergraduate research experiences (UREs) are widely recognized as a high-impact educational practice in engineering, contributing to students' technical competence, professional identity formation, and preparedness for graduate studies and research-oriented careers [1], [2], [3]. In many institutions, UREs serve as a bridge between coursework and independent inquiry, allowing students to integrate disciplinary knowledge, research methods, and scholarly communication skills within authentic research contexts. As a result, UREs are increasingly embedded within engineering curricula through capstone projects, research seminars, course-based undergraduate research experiences (CUREs), and structured research tracks.

While the pedagogical value of UREs is well documented, their implementation varies substantially across institutional contexts. Research-intensive universities often rely on informal apprenticeship models supported by graduate students, laboratory infrastructure, and stable research funding. In contrast, institutions with high teaching loads, rapidly expanding enrollments, and limited research infrastructure must navigate different constraints when designing research training opportunities. These conditions are not indicative of a lack of interest or capability; rather, they reflect structural realities that shape how research training can be organized, supported, and sustained.

This paper presents a case study of an international academic partnership between professors in Canada at the University British Columbia (UBC) and York University, and Mbarara University of Science and Technology (MUST) in Uganda, facilitated through Academics Without Borders (AWB). The partnership focused on co-designing a structured undergraduate engineering research program. Rather than importing a predefined model, the partnership sought to collaboratively design a research pathway aligned with local curricular structures, faculty workloads, institutional priorities, and long-term strategic goals.

The motivation for this work emerged from faculty-identified needs at MUST. Faculty members expressed a strong interest in strengthening undergraduate research preparation, particularly to support students pursuing graduate studies and research-oriented careers. However, they also identified challenges related to time, coordination, and scalability within existing teaching and administrative responsibilities. In response, MUST sought an external partnership through AWB to provide structured support for program design, curriculum mapping, and pedagogical co-development.

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From the perspective of engineering education scholarship, this project responds to a broader need for empirically grounded examples of how undergraduate research programs can be developed through equitable international partnerships. Much of the existing literature focuses on UREs in resource-intensive environments, with limited attention to collaborative design processes that respect local agency and institutional context. This paper aims to help fill that gap by documenting not only the program structure, but also the process by which it was co-designed.

The core problem addressed in this work is not the absence of research capacity or motivation, but rather the challenge of designing an undergraduate research program that is 1) structurally integrated within an existing engineering curriculum, 2) scalable without relying on unsustainable faculty workload, 3) aligned with institutional teaching and assessment practices, and 4) responsive to local pedagogical realities and strategic goals.

Without intentional design, undergraduate research opportunities risk becoming ad hoc, accessible to only a small subset of students, or overly dependent on individual faculty champions. Therefore, the challenge is to move from informal, individualized research supervision to a coordinated programmatic approach that remains flexible and context-sensitive.

Several potential approaches to developing an undergraduate research program were considered during early discussions with MUST faculty and administrators. These include expanding final-year capstone projects to include formal research components; creating a standalone undergraduate research course or summer research program; implementing course-based undergraduate research experiences (CUREs) within existing courses; and developing a multi-course research track that scaffolds research skills over time. Each option presented trade-offs related to faculty workload, curricular space, assessment alignment, and sustainability. Through collaborative discussion, it became clear that no single intervention would sufficiently address all constraints. Instead, a hybrid approach that leveraged existing courses while adding targeted supplementary content emerged as the most viable pathway.

The selected approach involved co-designing an undergraduate engineering research track embedded within the existing curriculum. This track integrates research skill development across multiple years of study through a combination of curricular and co-curricular learning activities. Curriculum mapping was used to identify existing courses that already support research-relevant competencies, and supplementary seminars and workshops were integrated to focus on research methods, ethics, and scholarly communication. Faculty development sessions were integrated to support sustainability in terms of uptake, delivery, and assessment practices. Lastly, a structured pathway was proposed, culminating in an independent undergraduate research project.

The methodology adopted in this project is grounded in design-based research and participatory curriculum development, emphasizing iterative refinement, faculty engagement, and contextual responsiveness. This paper aims to contribute to engineering education scholarship in three key ways. First, it provides a detailed, practice-oriented account of how an undergraduate research program can be co-designed through international partnership without relying on deficit-based narratives. Second, it documents concrete implementation strategies that may be transferable to other institutions navigating similar structural constraints. Finally, it presents early outcomes and evaluation plans that contribute to the growing literature on sustainable, scalable undergraduate research models.

2. LITERATURE REVIEW

Undergraduate research experiences (UREs) are widely recognized as high-impact educational practices that significantly enhance student learning, professional identity formation, and retention within engineering programs [1], [2]. UREs are increasingly being considered not only as elective add-ons, but also as essential pedagogical interventions that facilitate the transition from theoretical classroom learning to authentic technical practice [3]. For institutions in the Global South, such as those in Uganda, these experiences carry the additional weight of enhancing student competitiveness for international graduate programs and fostering regional research capacity [4].

Traditional URE models often rely on an informal apprenticeship style, which can be exclusionary and difficult to scale. Recent scholarship advocates for moving toward Course-based Undergraduate Research Experiences (CUREs) or integrated curricular frameworks that democratize access to research skills [5]. The success of such programs is largely defined by the intentionality of their design. Reisel et al. [3] argue that a successful engineering URE must move beyond technical outputs to focus on the student's ability to navigate the research process and communicate complex findings. In the Canadian context, CUREs have been recognized as effective means of developing Canadian Engineering Accreditation Board (CEAB) attributes of Problem Analysis and Investigation [6].

This project's strategy (discussed in the next section) of integrating seven core research competencies, ranging from design and statistics to entrepreneurship, into existing Biomedical Engineering (BME) courses aligns with the scaffolded approach identified in the literature as a predictor of student self-efficacy, defined as the belief in one's own capacity to perform as a researcher [7], [8]. Research has demonstrated that students who participate in

structured undergraduate research experiences exhibit stronger identification with research practice and a greater confidence in their ability to contribution original findings, leading to internalization of themselves as knowledge producers, rather than passive consumers [9]. This project operationalizes these principles through seven core research competencies (research methods, statistics and data analysis, laboratory practice, scholarly communication, independent thesis work, seminar participation, and entrepreneurship) that are scaffolded across Years 2 to 4 of the BME curriculum (discussed in detail in Section 3). This competency framework reflects the literature's emphasis on breadth of research training as a means of building experiences of developing competence across multiple domains, each reinforcing the student's emerging identity as a researcher [9], [10]. Furthermore, structuring the program to include a peer community provides a vital support structure that further increases this progress, reinforced by engaging with peers who are having similar learning experiences [11].

A persistent challenge in engineering education support through international partnerships is the gap between Western-centric "best practices" and local administrative realities. Henderson et al. (2011) emphasize that sustainable reform requires a shift from individual instructional changes to departmental strategies that foster a shared vision and align with local norms [12]. Crucially, the sustainability of a URE program is often tied to faculty engagement and the mitigation of hidden work often associated with mentorship [13], [14], [15]. The project's emphasis on a faculty-led adaptation is supported by literature on Communities of Practice, which suggests that pedagogical tools are most effective when they are internalized and reshaped by local practitioners to fit their specific institutional constraints and laboratory resources [16].

Successful North–South educational partnerships prioritize local ownership and iterative co-design over the simple transfer of external academic frameworks. Instead of adopting standardized North American models, context-responsive programs utilize existing curricular structures to expand research capacity within the limits of available resources [4]. This study addresses a gap in the literature to by demonstrating an empirical model documenting how international collaborations (e.g., via organizations like Academics Without Borders) can successfully embed research-intensive pathways within existing engineering departments in resource-constrained environments.

3. APPROACH

3.1. Partnership Structure and Collaboration

This project was implemented through a collaborative partnership between faculty volunteers from UBC and York and faculty at MUST, brought together by Academics Without Borders. Academics Without Borders (AWB) is a Canadian-based non-profit organization that supports capacity building in higher education within low- and middle-income countries by facilitating partnerships with volunteers from Canadian institutions whose expertise align with project goals. The partnership model emphasized co-designed iterative refinement and institutional ownership, echoing the shift from external academic imposition to local ownership and adaptation highlighted in the literature [4], [12]. Regular bi-weekly virtual meetings were held between the volunteers, MUST faculty and an AWB staff member, over a two-year period. This frequency enabled continuous feedback and alignment between MUST's institutional priorities and the pedagogical approaches being explored.

3.2. Identifying Elements of Undergraduate Research

An initial brainstorming session led to a list of training elements that would equip undergraduate engineering students to conduct graduate-level research. To assess how these elements aligned with MUST's priorities, structured questionnaires were distributed to more than 170 students, 30 faculty members and regional industry representatives. The responses were reviewed and themes were identified and compared against the initial list of elements. This process led to the compilation of seven essential components for the undergraduate engineering research program, shown in Table 1.

Table 1: Core Components of Undergraduate Engineering Research.

Item	Component	Content Examples
R1	**Research Methods**	Literature review, experimental design, data collection, analysis, interpretation, and research ethics
R2	**Statistics and Data Analysis**	Uncertainty, error propagation, outliers, Python, R programming
R3	**Laboratory**	Instrumentation, analytical equipment, data collection, measurement, calibration, hands-on learning, inquiry-based, exploratory
R4	**Communication (research)**	Writing research papers (journal articles), conference verbal presentations, poster presentations, 3-minute thesis (3MT)
R5	**Undergraduate Thesis**	Individual, independent research project

R6	**Research Seminar**	Undergrads observe grad student or faculty seminars, present their own work
R7	**Entrepreneurship**	Translation of research to company, start-up, R&D, and industry partnership

3.3. Curriculum Mapping and Program Design Strategy

A curriculum mapping approach was used to identify existing courses where research skill development could be integrated without requiring major structural changes to degree programs. The biomedical engineering (BME) program was chosen as a focus area because it was the most prominent engineering program at MUST, which is known for the medical sciences. Course syllabi, learning outcomes, and assessment structures were reviewed in detail to identify relevant course content aligned with one or more of the core components of undergraduate research. An initial comprehensive review was then shared with MUST faculty, which enabled feedback and clarifications around assumptions based on the provided course content. Table 2 shows the initial course mapping applied to second-year BME courses; the complete course mapping for the program is shown in Appendix A. The results of course mapping exercise where then revised through an in-person visit to MUST.

Table 2: Curriculum Review for Research Components

Course Code	Topic	Relevant Existing Content	Research Program Area
BME2111	BME Workshop Practice I	Setting up and repairing hardware of hospital equipment	Laboratory
BCE2215	Engineering Mathematics IV	Probability analysis and stats for designing research protocols	Statistics and Data Analysis
BCE2221	Object-Oriented Programming with Python	Testing, debugging, sorting, data structures	Statistics and Data Analysis
BME2212	BME Workshop Practice II	Setting up and repairing the hardware of hospital equipment	Laboratory
BME2301	BME Internship Training I	Internship with a biomedical engineering firm or related work (industry partnership)	Entrepreneurship

3.4. In-Person Visits to MUST

Two in-country visits played key roles in advancing the program design. The first visit focused on stakeholder engagement, institutional alignment, and needs assessment. Meetings were held with faculty, students, and academic leadership to better understand existing research practices and institutional priorities. Industry representatives were also consulted to gather perspectives on graduate skill requirements and collaboration opportunities. These engagements provided important contextual insight and the distribution of the questionnaires that informed subsequent program design. The second visit focused on collaborative program development workshops and curriculum integration planning. Workshops were conducted with faculty to outline the structure of a scaffolded undergraduate research model and to identify practical pathways for embedding research activities within existing courses. Discussions also included strategies for balancing instructional workload with new research-integrated teaching practices. These discussions were crucial for adapting the initial course mapping outcomes to MUST's specific needs and addressing the practicalities of implementation. Faculty members provided updated course syllabi and shared insights into their courses' pedagogical objectives, enabling tailored adjustments to the proposed research elements. For example, inquiry-based learning was proposed for inclusion in the BME Workshop Practice courses, where students could engage in hands-on research activities alongside their regular practical training. This integration was designed to introduce students to research methods early in their academic careers and build their competencies over time. Additionally, meetings with senior university administrators, including the Deputy Vice Chancellor, helped secure institutional support for the program and for resources and institutional frameworks to be in place for long-term success in implementing it, enabling it to be scaled through other departments.

4. RESULTS, OUTCOMES AND DISCUSSION

4.1. Key Stakeholder Perspectives

The questionnaire data provided a granular look at specific opportunities and challenges to implementing an undergraduate research program at MUST. Many students expressed a strong preference for more research-based courses, particularly capstone projects, and emphasized

that earlier exposure to research methods, data analysis, and problem formulation would significantly improve their preparedness for employment or graduate studies. Student responses also highlighted limited exposure to hands-on research, and expressed the need for experientially developing competence, as similarly noted by Jazayeri (2021) [10]. Faculty responses across the five engineering programs added critical structural context to these findings. Faculty feedback strongly supported curriculum redesigns that embed research skills, proposal writing, and analytical thinking throughout the undergraduate experience, rather than confining them to the final year. Instructors identified a lack of dedicated research laboratories and high student-to-resource ratios as primary barriers to scaling project-based learning. While there was a strong commitment to mentoring, these infrastructure limitations made it difficult to integrate traditional experimental learning for large cohorts. Furthermore, faculty feedback reinforced the literature regarding the "hidden work" of mentorship [13], identifying constraints in instructional workload. This finding was a key driver for the project's decision to move away from extensive curriculum changes and infrastructure-heavy models in favor of scaffolded integration of learning opportunities within existing courses. Industry questionnaire results provided complementary insights, revealing that local industrial capacity in Mbarara is insufficient to support large-scale internships, co-op placements, or industry-driven capstone projects. Industry partners emphasized the importance of transferable skills, critical thinking, data literacy, technical communication, and independent problem-solving. While industry collaboration was viewed as valuable, respondents acknowledged geographic and economic constraints that limit sustained engagement, reinforcing the need for alternative research-based education models that are not dependent on local industrial density.

4.2. Program Structure and Implementation

The proposed undergraduate research program was designed to integrate progressively into the existing curriculum, providing students with foundational research skills starting in their second year and culminating in a comprehensive, independent research project by their final year. The program focused on incorporating key research components into courses that were already part of the curriculum, reducing implementation barriers for students and avoiding new course development. The program's structure spans three academic years and was designed to build research capacity incrementally. Similar program structures were also proposed for the Mechanical and Industrial Engineering (MIE) and Electrical and Electronic Engineering (EEE) programs. Table 3 shows a summary of the proposed BME undergraduate research program.

Table 3: Proposed Structure of the Biomedical Engineering Undergraduate Research Program

Year	Courses	Proposed Research Content
Year 2	BME2111 Workshop Practice I	R1: Introduce research methods
	BCE2215 Engineering Math IV	R2: Probability and statistics applied to data analysis
Year 3	BME3111 Workshop Practice III	R1/R3: Literature review, prototyping, and problem validation
	BME3207 Junior BME Project	R1-R4: Apply the above skills to a design project.
	BCE3214 - Embedded Systems Programming and Design	R2: Introduce sessions on statistical analysis for data collected from embedded systems, including error propagation and data interpretation using Python/R.
Year 4	Two-week research training + BME 4112 Senior BME Project	R5/R6: Immersive research experience culminating in thesis
	BCE4223 – Entrepreneurship & Business Management	R1: Include research projects on market trends, customer needs, and competitive landscapes, encouraging students to conduct literature reviews and feasibility studies.
	BCE4202 - Professional Law and Ethics for Engineers	R1: Include research projects on market trends, customer needs, and competitive landscapes, encouraging students to conduct literature reviews and feasibility studies.
	BCE4112 - Control Systems	R2: Enhance the curriculum by incorporating data analysis tools for system performance evaluation, using statistical methods to handle uncertainty and outliers.

To further strengthen the identity and visibility of the undergraduate research experience, the proposal advocated developing a distinct program brand: the BME Research Certificate Program. It was intended that, by framing the experience through a branded lens, students would be repeatedly reminded of the specific research competencies they were developing and of how each curricular milestone contributed to their trajectory as emerging researchers. A core priority of this branding was to emphasize the pathways that lay beyond the undergraduate experience – specifically opportunities for graduate study, R&D positions in industry, and careers in academia. Crucially, the program was designed to ensure that students who completed the track felt recognized and rewarded for their participation; the culmination in a formal certificate was intended to provide a sense of prestige and incentive, signaling that their engagement with research was an addition to their standard degree requirements. This deliberate branding strategy is grounded in the literature on professional identity formation. By naming and consistently foregrounding the research competencies being developed, the program aims to reinforce students' self-perception as researchers throughout the undergraduate experience, rather than only at the point of graduation [9].

4.3. Program Adaptation

Following the collaborative design phase, faculty at MUST adapted the proposed framework into a formal departmental initiative within Biomedical Engineering, the Biomedical Engineering Research and Entrepreneurship Program, which provides a concrete structure for implementation and long-term sustainability. The adapted model builds on the proposed course-level content enhancements and includes a certificate pathway for senior undergraduate students, a recurring seminar series focused on research and innovation, and applied workshops designed to strengthen both research and entrepreneurial competencies. The seminar-centered format supports the development of a peer learning community that reinforces student identity formation as emerging researchers while also enabling flexible, modular integration with existing courses and faculty workloads. To illustrate the distinction: research content integrated into existing courses takes the form of additional assessments or module additions within the regular course timetable; for example, embedding a literature review assignment into BME3207 Junior BME Project, or introducing error propagation exercises in BCE2215 Engineering Mathematics IV. Seminars, by contrast, are standalone sessions outside the regular timetable that provide content not easily accommodated within existing courses, such as a structured workshop on academic writing for journal submission, a faculty-led session on navigating graduate school applications, or a guest presentation by a regional industry researcher. This modular distinction allows the program to grow incrementally without requiring formal curriculum approval for each new element.. This adaptation reflects the project's guiding principle of institutional ownership and local agency, ensuring that the program aligns with departmental priorities, available resources, and future opportunities for expansion across additional engineering disciplines.

To support implementation of the adapted program, a range of curricular resources, learning activities, and pedagogical strategies were shared with faculty at MUST to facilitate effective integration of the new research components. These included resources on active learning strategies, adaptations of existing hands-on workshops to emphasize inquiry-based learning, and approaches for embedding experimental design and data analysis. In addition, for the seminar series, an introductory Python workshop tailored for biomedical engineering students was developed, along with an accompanying faculty instructional guide to enable local faculty to deliver it and adapt it as needed.

4.4. Discussion

The initial input from students, faculty and staff, helped confirm the core learning components to include in the research program, while also highlighting structural priorities of the program (e.g, making use of existing courses vs. creating new ones). In-person visits enabled more detailed refinement of the proposed structure. Faculty engagement, while broadly positive, was accompanied by concerns about instructional workload – a finding consistent with the literature on the "hidden work" of research mentorship [13], [14], [15]. The decision to embed research components within existing courses, rather than requiring new course development, was a direct response to this constraint; however, even modular integration requires faculty to adapt their pedagogy, update assessments, and communicate new learning expectations to students. Sustaining this engagement over time will require ongoing institutional support, including recognition of research-integrated teaching in workload calculations and promotion criteria.

A second challenge concerns coordination across multiple courses and years of study. The scaffolded design of the program depends on a degree of alignment among faculty teaching different courses, which must be actively maintained as personnel change and syllabi evolve. The establishment of the Biomedical Engineering Research and Entrepreneurship Program as a formal departmental initiative provides a structural mechanism for this coordination, but its long-term effectiveness relies on faculty and institutional buy-in, which will be largely determined by the demonstration of student outcomes.

Finally, the scalability of the program to other engineering departments at MUST presents both an

opportunity and a risk. While the BME program provides a tested template, adaptation to different disciplinary contexts will require a repetition of the collaborative curriculum-mapping process described in this paper, consistent with the literature's emphasis on local ownership and iterative co-design [4].

4.5. Ongoing Work

Ongoing work for the Biomedical Engineering Research and Entrepreneurship Program focuses on systematically evaluating its effectiveness and long-term impact. A mixed-methods evaluation framework has been established, combining stakeholder questionnaires, workshop feedback, and implementation tracking metrics to assess student research preparedness, faculty instructional practices, and opportunities for industry engagement. Following stakeholder input and site observations, the framework was refined to emphasize scalable indicators, including the number of courses integrating research components, participation in seminars and workshops, and faculty implementation of research-integrated teaching practices. While the program now provides a scaffolded structure for research skill development, longitudinal data are needed to evaluate impacts on graduate study pathways, research productivity, and career outcomes. Future efforts, led by MUST faculty, will include repeated student surveys, standardized evaluation rubrics, and systematic tracking of program participation, and exploration of incentives such as research certificates or transcript notations. Partnerships with industry and external graduate programs are also being explored to enhance mentorship opportunities and provide students with practical, real-world exposure.

5. CONCLUSION

The co-design and implementation of the Biomedical Engineering Research and Entrepreneurship Program at MUST demonstrates that undergraduate research experiences can be systematically integrated into resource-constrained curricula through collaborative, context-sensitive partnerships. By leveraging existing courses, embedding research skill development across multiple years, and establishing a seminar-centered program with workshops and a certificate pathway, the initiative provides a scaffolded structure that supports student learning, professional identity formation, and preparation for graduate studies or research-oriented careers. Faculty adaptation and ownership ensured alignment with institutional priorities, sustainable integration into teaching workloads, and the creation of a peer learning community. Ongoing evaluation, including longitudinal tracking and the use of standardized metrics, will assess program effectiveness. This case study illustrates a replicable model for sustainable undergraduate research programs that respects local agency while maintaining rigorous, scaffolded development of research skills.

Acknowledgements

This work would not have been possible without the support of Academics Without Borders, especially Nabila Kara-Haji. The authors are incredibly grateful to the faculty, staff and students at Mbarara University of Science and Technology for their engagement, feedback and ongoing support throughout the project.

Based on completion of UBC's Ethics Screening Tool, under Article 2.5 of Canada's Tri-Council Policy Statement governing research involving human subjects this project has been deemed an ethics-exempt SoTL activity and therefore not subject to formal institutional ethical review.

Disclosure Statement

ChatGPT was used to align content derived from the authors' existing project reports and notes with the required conference paper template. The tool was also used for minor wording suggestions and synthesis of author-provided content. Content was substantially re-written to suit the purposes of this paper and all substantive intellectual contribution, and final written content were produced by the authors.

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Appendix A: CURRICULUM REVIEW AND CONTENT MAPPING

Table A1: Results form Curriculum Review for Research Components

Course Code	Topic	Relevant Existing Content	Research Program Area
BCE1121	Engineering Mathematics I	Statistical analysis skills for experimental and observational studies are mentioned in skills and competencies, but not described in content	Statistics and Data Analysis
DVS1203	Political Economy of Africa and Development	In content, topic 5: qualitative research methodology incl data analysis and research ethics	Research Methods
BME2111	BME Workshop Practice I	Setting up and repairing hardware of hospital equipment	Laboratory
BCE2215	Engineering Mathematics IV	Probability analysis and stats for designing research protocols	Statistics and Data Analysis
BCE2221	Object-Oriented Programming with Python	Testing, debugging, sorting, data structures	Statistics and Data Analysis
BME2212	BME Workshop Practice II	Setting up and repairing the hardware of hospital equipment	Laboratory
BME2301	BME Internship Training I	Internship with a biomedical engineering firm or related	Entrepreneurship

		work (industry partnership)	
MIE3101	Product Design and Development	Design and development of products, open-ended problem-solving, and prototyping	Entrepreneurship, Laboratory
BME3111	BME Workshop Practice III	Setting up and repairing hardware of hospital equipment, design thinking, prototyping	Laboratory
BME3203	Biomedical Instrumentation	Operation and troubleshooting of medical devices	Laboratory
BME3210	BME Workshop Practice IV	Fabrication - carpentry, welding, brazing, circuit analysis and design, device testing, and simulation	Laboratory
BME3207	Junior BME Project	Develop a design solution, literature review, a design report, and oral presentation	Research Methods, Communicat-ion
BME3301	BME Internship Training I	Internship with a biomedical engineering firm or related work (industry partnership)	Entrepreneur-ship
BME4112	Senior BME Project Design	Develop design solution, literature review, design report, and oral presentation	Research Methods, Communicat-ion
BCE4223	Entrepreneurship and Business Management	Innovation in technology, R&D, entrepreneurial process, create	Entrepreneur-ship
		and present business plan	
BME4212	Senior BME Project Implementation	Develop a design solution, a literature review, design report, and oral presentation	Research Methods, Communicat-ion