



# Notice of Intent (NOI)

MSc and PhD in Packaging Science

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# Summary

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science at Toronto Metropolitan University (TMU) will prepare graduates to address the growing challenges facing the global packaging industry. Packaging plays a vital role in protecting products, ensuring safety, enabling efficient logistics, and shaping consumer experiences across many sectors of the economy. At the same time, increasing environmental concerns, regulatory pressures, and changing consumer expectations are driving the need for innovative packaging systems that reduce environmental impact while maintaining performance and efficiency.

The MSc program in Packaging Science will provide interdisciplinary graduate training in packaging materials, packaging systems design, sustainability frameworks, consumer behaviour, and applied research methods. The PhD program in Packaging Science will build on this foundation by emphasizing advanced, original research, theoretical development, and innovation in packaging systems, preparing graduates for leadership roles in academia, industry, and policy.

The MSc program's objectives are to develop advanced knowledge and applied problem-solving skills in packaging systems through interdisciplinary coursework and research-based learning; prepare graduates to integrate sustainability into packaging design, production, and end-of-life management in support of circular economy principles and environmental responsibility; develop expertise in packaging materials, packaging design, packaging systems, and sustainability; train students to conduct rigorous applied research and analytical problem-solving in packaging science and technology; foster collaboration with industry and community partners through experiential learning and applied research activities; and prepare graduates to apply evidence-based approaches to address complex packaging challenges in professional and research settings. The PhD program's objectives are to generate original knowledge and theoretical contributions that advance packaging science and innovation; develop advanced expertise in packaging materials, packaging systems, sustainability, and emerging technologies; prepare graduates to conduct independent, high-impact research and lead interdisciplinary collaboration across academic, industry, and policy environments; and advance sustainable packaging solutions that create measurable industrial, environmental, and societal impact.

Through graduate-level coursework and independent research, students in these programs will develop the analytical, technical, and research skills needed to contribute to innovation in packaging systems.

Packaging is a critical component of modern economies and global supply chains. The global packaging market exceeds USD 1 trillion, and the Canadian packaging sector continues to grow due to expanding e-commerce, product safety requirements, and sustainability initiatives.

Despite the industry's importance, Canada currently has no graduate-level degree programs focused specifically on packaging science and packaging systems. Existing training

opportunities are primarily technical certificates or undergraduate programs that do not address the interdisciplinary research challenges facing the sector.

The proposed MSc and PhD in Packaging Science will address this gap by providing both: Professional and applied research training (MSc) and Advanced research and knowledge creation (PhD). Graduates will be equipped to contribute to the development of advanced materials, innovative packaging technologies, and responsible packaging systems, while PhD graduates will further contribute through high-impact research, policy development, and academic leadership.

Student demand for advanced education in packaging is already evident at TMU. Packaging is currently the most popular concentration within the undergraduate Graphic Communications Management (GCM) program, demonstrating strong student interest and providing a clear pathway for graduate study.

In addition to GCM graduates, the programs will attract students from related fields such as engineering, environmental science, chemistry, materials science, supply chain management, design, and business. The MSc in Packaging Science will appeal to students seeking advanced professional and research-oriented training. The PhD in Packaging Science will attract highly qualified candidates interested in pursuing academic, industrial R&D, or policy-focused careers. As sustainability becomes increasingly important across industries, demand for professionals and researchers with expertise in packaging systems is expected to continue growing.

Graduates will be prepared for careers in packaging design, sustainability consulting, regulatory compliance, materials innovation, and research and development across sectors such as food and beverage, consumer goods, pharmaceuticals, logistics, and packaging manufacturing.

Admission will be based on a holistic assessment of academic preparation and research potential. MSc applicants will normally hold a four-year undergraduate degree from an accredited institution, with a minimum cumulative average equivalent to a B (or 3.0/4.33) in the last two years of study, in accordance with the university's graduate admission requirements. PhD applicants will normally hold a relevant master's degree (or equivalent), with demonstrated research excellence and potential for independent scholarship, with a minimum academic standing equivalent to a B+ (or 3.3/4.33) in graduate-level coursework, in accordance with university graduate admission requirements.

Applicants will submit Official academic transcripts, a statement of research interests related to packaging science, two letters of reference assessing academic ability and research potential.

The programs are designed to attract applicants from Graphic Communications Management and related disciplines, including engineering, environmental studies, chemistry, materials science, design, and supply chain management.

# 1 Program Overview

## 1.1 Program description

### Name and description of the proposed program

The proposed program is the Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science, to be offered by the School of Graphic Communications Management (GCM) within The Creative School at Toronto Metropolitan University (TMU). The program will provide interdisciplinary graduate education focused on the science, engineering, design, and sustainability of packaging systems.

Packaging plays a critical role in modern economies by protecting products, enabling global distribution, and shaping consumer experiences. At the same time, the industry faces increasing pressure to develop environmentally responsible packaging solutions that reduce waste, improve recyclability, and support circular economy initiatives. The proposed programs address these challenges through integrated scientific, technical, and systems-level approaches to packaging.

The MSc in Packaging Science will equip students with advanced knowledge and research skills in packaging materials, packaging design, sustainability frameworks, consumer behaviour, and packaging systems design. Through a combination of coursework and independent research, students will develop the ability to analyze complex packaging challenges and generate innovative solutions that balance performance, safety, cost, and environmental responsibility. The MSc emphasizes applied research and industry engagement, preparing graduates for professional and research-oriented roles in packaging innovation and sustainability.

The PhD in Packaging Science will focus on advanced, original research and the development of new knowledge in packaging systems. Doctoral students will conduct independent, high-impact research addressing complex challenges in areas such as sustainable materials, advanced packaging technologies, circular economy systems, and consumer-packaging interactions. The PhD program will prepare graduates for leadership roles in academia, industrial research and development, and policy.

### The proposed degree designation(s)

The proposed degree designations are:

- Master of Science (MSc) in Packaging Science
- Doctor of Philosophy (PhD) in Packaging Science

These designations reflect the programs' strong emphasis on scientific inquiry, technical expertise, and research-based learning. MSc and PhD students will complete graduate-level

coursework. MSc students will deliver a thesis while PhD students will complete advanced research culminating in a doctoral dissertation that demonstrates a significant original contribution to the field.

## Designated Academic Unit

The designated academic unit responsible for the programs will be the School of Graphic Communications Management (GCM) within The Creative School. GCM has long-standing expertise in packaging education, print and packaging technologies, and strong industry collaboration, providing a solid foundation for the development and delivery of both MSc- and PhD-level training in packaging science.

## Program Governance Structure

The programs will be governed through a GCM Graduate Program Council, which will oversee curriculum development, program policies, admissions, and academic standards for both the MSc and PhD.

The council will be chaired by the Graduate Program Director (GPD), who will provide academic leadership and be responsible for:

- Coordination of teaching and research activities
- Oversight of admissions and student progress
- Supervision of graduate program operations

Administrative support will be provided by a part-time Graduate Program Administrator (GPA). The governance structure will ensure alignment with the policies and procedures of TMU's Yeates School of Graduate and Postdoctoral Studies (YSGPS) and support effective program administration, quality assurance, and continuous program improvement across both degree levels.

## 1.2 Program objectives

### Program Objectives

The Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science aim to prepare graduates with advanced scientific knowledge, research skills, and interdisciplinary expertise to address the evolving challenges of packaging systems in a sustainability-driven global economy. The programs integrate materials science, packaging design, sustainability frameworks, and consumer insights to support innovation in packaging design, production, and end-of-life management.

The MSc program focuses on developing applied research capabilities, technical expertise, and professional skills for careers in industry and research-oriented roles.

The PhD program emphasizes advanced, original research and the development of new knowledge, preparing graduates for leadership roles in academia, industrial research and development, and policy.

The key objectives of the programs are to:

|                                                  | MSc                                                                                                                                                                                                                     | PhD                                                                                                                                                                                                       |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PO1: Advance Scientific Knowledge                | Promote interdisciplinary education and applied research in packaging science by integrating packaging materials, packaging design, sustainability, and packaging systems within a research-based learning environment. | Generate original research and theoretical contributions that strengthen packaging science and support innovation across academic, industrial, and policy contexts.                                       |
| PO2: Promote Sustainable Practices               | Integrate circular economy principles, life-cycle thinking, and environmental responsibility into packaging design, production, and end-of-life management to support sustainable packaging practices.                  | Advance sustainable packaging innovation through research that develops and transforms packaging systems, materials, technologies, and policies addressing complex environmental and societal challenges. |
| PO3: Develop Research Expertise                  | Train students to conduct rigorous, applied research and analytical problem-solving in packaging systems.                                                                                                               | Develop the capacity to advance knowledge in packaging science which contributes to academic and industry innovation.                                                                                     |
| PO4: Foster Research and Industry Collaboration  | Connect students with industry and community partners through experiential learning and applied research opportunities that strengthen professional practice and workforce readiness in packaging science.              | Facilitate interdisciplinary research partnerships that promote knowledge mobilization, research leadership, and innovation across academic, industry, and policy environments in packaging science.      |
| PO5: Strengthen Professional and Societal Impact | Equip graduates with the skills to evaluate and improve packaging systems in professional and applied research settings.                                                                                                | Prepare graduates to lead transformative research and innovation initiatives that create measurable industrial, environmental, and societal impact.                                                       |

## Appropriateness of Degree Designations

The proposed degree designations - Master of Science (MSc) in Packaging Science and Doctor of Philosophy (PhD) in Packaging Science - are appropriate given the programs' strong emphasis on scientific inquiry, technical knowledge, and research-based learning.

The MSc designation reflects the program's focus on advanced scientific and applied research training, including graduate coursework and a thesis that demonstrates the application of analytical and scientific methods to packaging-related challenges.

The PhD designation is appropriate as the program requires the completion of independent, original research that makes a significant contribution to the field of packaging science. The PhD emphasizes theoretical advancement, methodological rigour, and innovation, consistent with doctoral-level expectations in science and engineering disciplines.

Together, the MSc and PhD designations align with the programs' objectives of advancing knowledge, supporting innovation, and developing highly qualified personnel capable of addressing complex challenges in packaging systems.

## 1.3 Alignment of the program objectives with the University's mission and academic plan

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science align strongly with Toronto Metropolitan University's Strategic Vision, including the [Academic Plan 2025–2030](#) and the [Strategic Research Plan](#), by advancing applied, interdisciplinary, and impactful graduate education in a field of growing global importance.

### Alignment with TMU Academic Plan

The programs reflect TMU's commitment to experiential learning, scholarly research, creative (SRC) excellence, and industry engagement. By integrating materials science, packaging design, sustainability, and consumer insights, the programs embody the university's emphasis on interdisciplinary approaches to solving complex, real-world challenges.

The TMU Academic Plan 2025–2030 identifies five key priorities:

1. Enhance the learning journey for greater student success
2. Create positive impact through SRC excellence and local and global collaboration
3. Support people and community
4. Continue our commitment to Truth and Reconciliation
5. Ensure future readiness

The objectives of the MSc and PhD in Packaging Science align with these priorities as outlined below.

**Table 1.1: Program objectives mapping with academic plan**

| Program Objectives                                   | Academic Plan Priorities |   |   |   |   |
|------------------------------------------------------|--------------------------|---|---|---|---|
|                                                      | 1                        | 2 | 3 | 4 | 5 |
| Advance Scientific Knowledge                         | x                        | x |   |   | x |
| Promote Sustainable Practices                        |                          |   | x | x |   |
| Develop Research Expertise                           | x                        | x |   |   | x |
| Foster Research and Industry Collaboration           |                          |   | x |   | x |
| Strengthen Professional Industry and Societal Impact |                          |   | x |   | x |

## Alignment with TMU Strategic Vision and Research Priorities

The proposed programs support TMU's Strategic Research Plan by advancing interdisciplinary, impact-driven research in areas such as sustainable materials, circular economy systems, consumer behaviour, and packaging innovation. The inclusion of both MSc and PhD levels strengthens TMU's capacity to develop highly qualified personnel (HQP) and to contribute to research excellence at both applied and theoretical levels.

As packaging systems face urgent challenges related to sustainability, regulation, and technological change, the programs:

- Enhance the learning journey through experiential learning, research training, and industry collaboration
- Advance SRC excellence by fostering interdisciplinary research and knowledge mobilization
- Support communities by addressing environmental and societal challenges through responsible packaging systems
- Promote inclusion and accessibility through EDIA-informed curriculum and research practices
- Ensure future readiness by preparing graduates for leadership in a rapidly evolving global industry

Equally important, the programs embody TMU's core values by embedding sustainability into the curriculum and research, promoting equity, diversity, inclusion, and accessibility (EDIA), and fostering innovation through applied problem-solving.

Overall, the MSc and PhD in Packaging Science position TMU as a leader in packaging scholarship and industry engagement, contributing to the university's mission to create meaningful impact through education, research, and collaboration at local, national, and global levels.

## 1.4 Societal need and student demand

### Societal Need and Labour Market Demand

Packaging is ubiquitous across all sectors of the global economy and plays a critical role in product protection, distribution, safety, accessibility, and consumer experience. The global packaging market is projected to grow from approximately USD 1.17 trillion in 2023 to USD 1.42 trillion by 2028, representing a compound annual growth rate (CAGR) of 3.9% ([Smithers, The Future of Global Packaging to 2028](#)). The Canadian packaging industry is also experiencing sustained growth and is projected to reach approximately USD 31.4 billion by 2034, driven by increasing demand for sustainable materials, technological innovation, smart packaging systems, and the continued expansion of e-commerce ([IMARC Group, Canada Packaging Market Report](#)). While global trade dynamics continue to evolve, including expanding trade relationships with China and Southeast Asia, these developments are expected to further reinforce demand for packaging innovation, supply chain resilience, sustainable materials, and advanced manufacturing capabilities. At the same time, the packaging sector faces significant environmental and societal challenges related to packaging waste, recyclability, accessibility, material innovation, and regulatory compliance. These challenges align closely with several [United Nations Sustainable Development Goals \(SDGs\)](#), particularly SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action), highlighting the growing need for advanced education and research in sustainable packaging science and innovation.

Packaging plays a critical societal role in product protection, safety, distribution efficiency, and consumer experience. At the same time, the sector faces urgent and complex challenges, including reducing environmental impact, improving recyclability and circularity, advancing material innovation, and responding to evolving regulatory and consumer expectations.

Despite the scale and importance of the industry, Canada currently lacks graduate-level programs dedicated specifically to packaging science. Existing programs, such as Conestoga College's graduate certificate in Structural Packaging Design, provide technical training but do not offer the depth of interdisciplinary, research-intensive education required to address the scientific, environmental, and systems-level challenges facing the sector. The absence of graduate programs in packaging science reflects a gap in the Canadian higher education landscape rather than a lack of industry need. In fact, the increasing emphasis on sustainable packaging, regulatory compliance, materials innovation, and circular economy practices has created growing demand for professionals with advanced research and analytical expertise. The proposed MSc and PhD programs are therefore expected to provide significant value to Canadian industry by preparing highly qualified personnel capable of supporting innovation, research and development, sustainability strategy, and evidence-based decision-making across the packaging value chain.

The proposed MSc and PhD in Packaging Science at TMU will address this gap by offering comprehensive graduate education that integrates materials science, packaging design, sustainability, and consumer insights. The programs will combine scientific training with applied and fundamental research, enabling students to develop innovative solutions to real-world packaging challenges.

- The MSc program will emphasize applied, practice-oriented research and professional skill development, preparing graduates for immediate impact in industry and research settings.
- The PhD program will focus on advanced, original research that contributes to new knowledge, technological innovation, and policy development in packaging science.

Graduates of the programs will be well-positioned to enter a wide range of careers, including packaging design, materials innovation, sustainability consulting, regulatory compliance, and research and development across sectors such as food and beverage, consumer goods, pharmaceuticals, logistics, and packaging manufacturing. PhD graduates will additionally be prepared for academic careers and senior research leadership roles in industry and government.

Based on recent and ongoing employment opportunities across North America, typical career pathways include:

#### *Industry Positions*

- **Packaging Specialist / Designer / Engineer / Coordinator** – designing, coordinating, and/or testing packaging systems for performance, cost-efficiency, and reduced environmental impact.
- **Packaging Sustainability Specialist** – leading corporate initiatives on sustainable materials, recyclability, and Extended Producer Responsibility (EPR) compliance.
- **Packaging Consultant (Sustainability/LCA)** – advising companies on life cycle assessment (LCA), carbon footprint analysis, and circular economy strategies.
- **R&D Scientist (Packaging Materials)** – innovating in biopolymers, chemical recycling, barrier coatings, and eco-friendly packaging solutions.
- **Regulatory & Compliance Analyst** – ensuring packaging systems align with evolving Canadian, U.S., and international packaging sustainability policies.

#### *Research and Development / Academic Roles*

- **Assistant Professor / Doctoral Researcher / Postdoctoral Fellow / Research Associate (PhD in Packaging or Sustainability)** – advancing scholarship on packaging-product waste dynamics, sustainable supply chains, and human-packaging interaction.
- **Laboratory Scientist / Test Engineer** – working in ISTA-certified or ASTM-compliant labs to simulate hazards (shock, vibration, compression, climate) and improve packaging performance.

Demand for packaging expertise spans a wide range of sectors, including food and beverage, consumer electronics, pharmaceuticals, cosmetics, retail, e-commerce, logistics, automotive manufacturing, and packaging supply companies. Major organizations such as Nestlé, Coca-Cola, Amazon, Shopify, L'Oréal, Pfizer, Dow, Amcor, and Atlantic Packaging, among many others, actively seek professionals with expertise in packaging systems, sustainability, and materials innovation. Many of these job opportunities require postgraduate qualifications, such as a doctoral or master's degree, reflecting the increasing demand for advanced technical knowledge, research skills, and interdisciplinary expertise in the field.

#### *Examples of Sector-Specific Job Openings Looking for Packaging Experts*

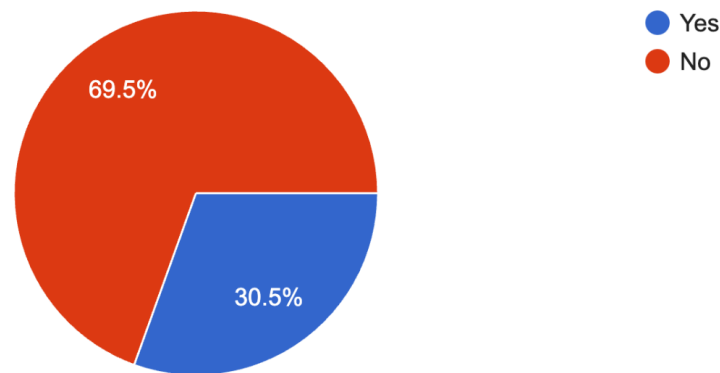
- **Food & Beverage** – Nestle Canada, Hersheys, Mondelēz International, Tim Hortons, Kraft Heinz, Coca-Cola, PepsiCo, Lindt & Sprüngli, Danone
- **Consumer Electronics** – Apple, Google, Microsoft, GE, HP, Samsung, LG, Xanadu
- **Cosmetics / Personal Care / Pharmaceutical** – The Ornidary, L'Oréal, MAC, Procter and Gamble, Unilever, Pfizer, SC Johnson, Eil Lilly and Company, Iovate

- **Retailers** - Canadian Tire, Loblaws, Home Depot, Whole Foods Market, PetSmart, Target, Walmart
- **E-commerce / Logistics** – Amazon, Shopify, UPS, DHL, FedEx, HelloFresh
- **Automotive** - Ford, GM, Toyota, Honda, Tesla, Harley-Davidson, BMW
- **Packaging Suppliers:** Amcor, Dow, Husky, Niagara Bottling, Atlantic Packaging, International Paper, WestRock, Henkel, Graphic Packaging International, Coty
- **Government / University** – University of Auburn, Virginia Tech, Michigan State University, San Jose State University, Rochester Institute of Technology, National Research Council Canada

Together, the rapid growth of the packaging industry, increasing sustainability requirements, and regulatory pressures demonstrate a strong societal and labour market need for advanced expertise in packaging systems.

## Student Demand

Student demand for advanced education in packaging is already evident at Toronto Metropolitan University. Packaging is currently the most popular concentration among four concentrations available within the undergraduate Graphic Communications Management (GCM) program, with 62 of 117 students (53%) who declare concentrations selecting it in 2023/2024 and 70 of 140 students (50%) selecting it in 2024/2025, demonstrating strong student interest and providing a clear pipeline for graduate study. (GCM PPR, GCM Alumni survey response, Senate approved Jan 20th, 2026)



**Figure 1.1: Survey results from GCM alumni in response to “Are you currently enrolled in, planning to pursue, or have completed further education (e.g. MA, MS, MBA, PhD) or another type of course?”**, GCM PPR, GCM Alumni survey response, Senate approved Jan 20th, 2026

The proposed MSc and PhD in Packaging Science will create a natural progression pathway for GCM graduates seeking to deepen their expertise in packaging science, sustainability, and research, with the MSc supporting advanced professional and applied research training and the PhD preparing highly qualified candidates for independent research and academic or industrial research careers. This need is further supported by alumni survey findings demonstrated in the above figures showing that, beyond gainful employment after graduation, 30.5% of respondents indicated an interest in or pursuit of further studies, highlighting a stronger-than-anticipated

demand for graduate education opportunities within GCM. In addition, GCM has maintained a strong and consistent graduating cohort, with an average of approximately 146 graduates annually over the past three years (151 in 2023, 142 in 2024, and 146 in 2025), further demonstrating the potential pipeline of students who may pursue graduate-level education within the discipline.

In addition to GCM graduates, the programs are expected to attract applicants from related disciplines such as engineering, environmental science, chemistry, materials science, supply chain management, design, and business, reflecting the inherently interdisciplinary nature of packaging systems.

As sustainability, circular economy principles, and responsible materials management become increasingly central to product design and manufacturing, demand for specialized graduate education in packaging science is expected to continue growing. The proposed programs will position TMU to meet this demand while supporting the development of highly qualified personnel and advancing innovation in an industry of significant economic and societal importance.

## 1.5 Comparator programs from within the province or beyond

There are currently no graduate-level packaging programs in Canada. International comparators provide context for curriculum, structure, and program length (see the examples shown in the following Table).

**Table 1.2: Comparative master program analysis**

| <b>Institution</b>                                                        | <b>Program Name</b>     | <b>Program Length and # coursework required</b> | <b>Curriculum Focus</b>                                                                                   | <b>Comparison to TMU Proposal</b>                                                                                                                 |
|---------------------------------------------------------------------------|-------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Michigan State University, School of Packaging                            | MS in Packaging         | 2 years (5 courses + thesis)                    | Food packaging, Packaging materials, Packaging distribution and dynamics, Supply chain, Medical packaging | Focuses on technical and engineering aspects; TMU adds sustainability, consumer behavior, package printing and interdisciplinary applied research |
| Clemson University, Department of Food, Nutrition, and Packaging Sciences | MS in Packaging Science | 2 years (8 courses +thesis)                     | Materials science, design, Packaging distribution and Dynamics, Packaging systems, Consumer Behavior      | Primarily technical; TMU emphasizes broader sustainability and design integration                                                                 |

|                                                                                       |                                                |                                                                                       |                                                            |                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rochester Institute of Technology, Department of Packaging and Graphic Media Science) | MS in Packaging Science                        | 1.5–2 years (8 courses + thesis)                                                      | Packaging Distribution, and Dynamics, Food Packaging       | Similar technical depth; the TMU program includes applied research in sustainability and the circular economy                                                                                               |
| San Jose State University, Department of Nutrition, Food Science, and Packaging       | MS in Packaging                                | 2 years (7 courses+, excluding thesis credits)                                        | Food Packaging, Packaging Distribution and Dynamics        | Similar technical depth; the TMU program includes applied research in sustainability and the circular economy                                                                                               |
| Pratt Institute, Department of Communications Design                                  | MS in Packaging, Identities and Systems Design | 2 years (14 courses + capstone project)                                               | Design, communication                                      | Visual design-focused program; Not research-oriented program. No thesis option. TMU integrates design with materials science, distribution, and sustainability, as well as offering research opportunities. |
| Munich University of Applied Sciences                                                 | MEng in Packaging Technology                   | 1.5 years (approx 10 to 12 short courses or modules - equivalent to 5-6 full courses) | Engineering, Materials, Manufacturing processes            | Technical/engineering focus; TMU emphasizes interdisciplinary and applied sustainability research                                                                                                           |
| Yonsei University, Department of Packaging & Logistics                                | MS in Packaging and Logistics                  | 2 years (7 courses + thesis/seminar)                                                  | Materials, Logistics, Packaging Distribution and Logistics | Similar technical depth; TMU program includes applied research in sustainability, circular economy and package printing                                                                                     |

**Table 1.3: Comparative PhD program analysis**

| <b>Institution</b>         | <b>Program Name</b> | <b>Program Length and # coursework required</b> | <b>Curriculum Focus</b>                 | <b>Comparison to TMU Proposal</b>                                            |
|----------------------------|---------------------|-------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------|
| Michigan State University, | PhD in Packaging    | 4–5 years (4-6 courses + comprehensive          | Packaging materials, packaging systems, | One of the few dedicated packaging PhD programs globally. Strong engineering |

|                                                                           |                                                                            |                                        |                                                                                  |                                                                                                                                                                                                           |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| School of Packaging                                                       |                                                                            | exams + dissertation)                  | distribution dynamics, food packaging, and sustainability                        | and materials focus; TMU would emphasize interdisciplinary research, including sustainability, consumer behaviour, packaging systems, and industry collaboration.                                         |
| Clemson University, Department of Food, Nutrition, and Packaging Sciences | PhD in Food, Nutrition, and Packaging Sciences                             | 4–5 years (4-6 courses + dissertation) | Packaging science, food packaging systems, materials science, product protection | Primarily technical and food-focused, TMU would broaden the research scope to include packaging systems, sustainability frameworks, consumer behaviour, and applied research collaboration with industry. |
| Virginia Tech, Department of Sustainable Biomaterials                     | PhD in Sustainable Biomaterials (Emphasis on Packaging Systems and Design) | 4–5 years (4-5 courses + dissertation) | Biomaterials, materials science, sustainable materials, packaging materials      | Strong materials and biomaterials research focus; TMU would integrate materials research with packaging design, systems thinking, consumer behaviour, and supply chain considerations.                    |
| Auburn University, Department of Biosystems Engineering                   | PhD in Biosystems Engineering (Packaging research track)                   | 4–5 years (4-6 courses + dissertation) | Packaging systems, distribution testing, and product protection engineering      | Engineering and distribution-focused research; TMU would complement this with sustainability, consumer interaction, and packaging communication research.                                                 |
| Yonsei University, Department of Packaging & Logistics                    | PhD in Packaging and Logistics                                             | 4 years (4-6 courses + dissertation)   | Packaging systems, logistics, materials, supply chain systems                    | Focus on packaging logistics and distribution systems; TMU would incorporate broader interdisciplinary research, including sustainability, design, and consumer behaviour.                                |

The proposed MSc and PhD programs in the packaging field at Toronto Metropolitan University differ from existing programs through their interdisciplinary focus and strong emphasis on sustainability and applied research. While many international packaging programs focus primarily on technical or engineering aspects, the TMU programs integrate materials science, packaging design, sustainability frameworks, and consumer behaviour, providing a broader perspective on packaging systems.

The programs also place sustainability, materials science and applied research at the centre of the curriculum and research agenda, incorporating circular economy principles, life-cycle thinking, and environmentally responsible materials and processes throughout coursework and scholarly activities. In addition, strong industry connections through the School of Graphic

Communications Management and the Centre for Packaging Innovation and Sustainability (CPIS) support applied, practice-led research that addresses real-world packaging challenges.

Finally, the proposed programs fill a significant gap in Canadian graduate education, as no universities in Canada currently offer graduate degrees focused specifically on packaging science or sustainable packaging systems. As a result, the MSc and PhD programs position Toronto Metropolitan University as a national leader in packaging education and research, supporting innovation and workforce development in an industry of growing economic and societal importance.

## 1.6 Overlap/Integration with other programs at TMU

There is currently no comparable graduate program in packaging science at Toronto Metropolitan University (TMU) or elsewhere in Canada. The proposed MSc and PhD in Packaging Science degrees are therefore distinct in their focus and fill a clear gap in graduate-level education. While some thematic overlap may exist with other programs in areas such as sustainability, materials, and systems analysis, the proposed programs are uniquely positioned in their integrated focus on packaging materials, packaging design, systems design, and consumer-packaging interactions.

Potential areas of overlap may arise with existing graduate programs such as Environmental Applied Science and Management (EnSciMan), Management Science, and Communication and Culture. However, these programs approach related topics from different disciplinary perspectives and do not focus specifically on packaging systems.

- EnSciMan emphasizes environmental systems and policy, whereas Packaging Science focuses on the design, materials, and lifecycle of packaging systems.
- Management Science focuses on operations, analytics, and decision-making, while Packaging Science applies these principles specifically within packaging and supply chain contexts.
- Communication and Culture explores media, communication, and societal impacts, whereas Packaging Science incorporates consumer behaviour specifically in relation to packaging design and user interaction.

The introduction of the proposed programs is expected to complement and strengthen existing graduate programs at TMU, including EnSciMan, by providing an additional disciplinary pathway focused specifically on packaging science and sustainable packaging systems. The programs will create new opportunities for interdisciplinary collaboration, shared research initiatives, and co-supervision across related fields. Rather than drawing students away from existing programs, the MSc and PhD in Packaging Science are expected to broaden TMU's graduate offerings and attract additional students with specialized interests in packaging systems, sustainability, materials, and applied research.

## 2 The Program

### 2.1 Learning Outcomes

#### Master of Science (MSc) in Packaging Science – Learning Outcomes

Graduates of the MSc in Packaging Science will be able to:

1. Synthesize theory, research, and practice to generate innovative, real-world packaging solutions that advance the field and contribute to industry transformation.
2. Develop innovative packaging solutions that balance performance and sustainability by integrating cutting-edge materials science and packaging design principles
3. Advance sustainable packaging design and production by evaluating complex scientific, technical and regulatory challenges
4. Conduct independent and collaborative research in packaging science using qualitative or quantitative methods.
5. Integrate sustainability frameworks into packaging decision-making to strategically minimize environmental and social impacts.
6. Coordinate packaging strategies to meet stakeholder needs by analyzing market trends, consumer behavior, and supply chain dynamics.
7. Communicate complex scientific information effectively to diverse audiences through written, oral, and visual media.
8. Collaborate with interdisciplinary teams, demonstrating leadership, project management, and ethical decision-making in packaging-related contexts.
9. Apply ethical, equitable and accessible reasoning to packaging research and practice.
10. Optimize packaging systems by utilizing analytical, digital, and technical tools. .

#### Doctor of Philosophy (PhD) in Packaging Science – Learning Outcomes

Graduates of the PhD in Packaging Science will be able to:

1. Generate original knowledge and theoretical contributions that advance the field of packaging science.
2. Design and conduct independent, high-impact research addressing complex challenges in packaging systems, materials, and sustainability using appropriate methodologies, such as experimental, computational, or systems-based approaches.
3. Lead interdisciplinary research initiatives which collaborate across academic, industry, and policy contexts.
4. Create solutions to environmental and societal challenges by integrating sustainability, systems thinking, and global perspectives into applied research.
5. Lead the dissemination and mobilization of research findings to influence scholarly, industry, policy, and public discourse in packaging science.

6. Design and innovate research that is informed by ethical practices including equity, diversity, inclusion and accessibility frameworks.

## Equity, Diversity, Inclusion, and Accessibility (EDIA) Integration

An Equity, Diversity, Inclusion, and Accessibility (EDIA) lens has been integrated into the development of the learning outcomes for both the MSc and PhD in Packaging Science. The programs recognize that packaging systems intersect with diverse communities, global supply chains, and environmental justice considerations. Accordingly, the learning outcomes prepare graduates to address packaging challenges in ways that are inclusive, socially responsible, and responsive to the needs of diverse populations.

EDIA principles are reflected in outcomes related to collaboration, interdisciplinary research, ethical decision-making, and effective communication with diverse audiences. Students are expected to engage respectfully with multiple perspectives and contribute to inclusive research and innovation environments.

The programs also emphasize accessibility- and equity-informed approaches to packaging design and systems, including consideration of how packaging affects users with varying abilities, cultural contexts, and socio-economic conditions. This includes attention to usability, accessibility, and inclusive design practices.

In addition, the integration of sustainability frameworks, such as circular economy principles, life cycle assessment, and the United Nations Sustainable Development Goals (SDGs), encourages students to examine environmental and social impacts across global systems. These approaches support a broader understanding of equity and responsibility in packaging innovation.

Together, these learning outcomes ensure that graduates develop advanced technical and research expertise alongside the capacity to apply inclusive, ethical, and socially responsible approaches in packaging science. These principles are embedded throughout the programs' curriculum, research training, and thesis/dissertation requirements, ensuring alignment with graduate-level expectations at Toronto Metropolitan University.

## 2.2 Appropriateness of the learning outcomes in meeting the Graduate Degree Level Expectations

- *Complete the table below to map each learning outcome to TMU's Graduate Degree Level Expectations.*
- *To complete the table, map each LO to the GDLEs using Table 1 (for proposed Master's level programs) or Table 2 (for proposed PhD level programs).*
- *Collectively, the LOs should address all of the GDLEs. If any GDLEs are only partially addressed, provide a rationale.*

**Table 2.1: Master's Level Graduate Degree Level Expectations (GDLEs)**

| <b>GDLEs</b>                             | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Depth and Breadth of Knowledge</b>    | A systematic understanding of knowledge, including, where appropriate, relevant knowledge outside the field and/or discipline, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Research and Scholarship</b>          | A conceptual understanding and methodological competence that: <ul style="list-style-type: none"> <li>a) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;</li> <li>b) Enables a critical evaluation of current research, advanced research, and scholarship in the discipline or area of professional competence; and</li> <li>c) Enables a treatment of complex issues and judgments based on established principles and techniques; and</li> <li>d) On the basis of that competence, has shown at least one of the following: <ul style="list-style-type: none"> <li>i. The development and support of a sustained argument in written form; or</li> <li>ii. Originality in the application of knowledge.</li> </ul> </li> </ul> |
| <b>Level of Application of Knowledge</b> | Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Professional Capacity/Autonomy</b>    | The qualities and transferable skills necessary for employment requiring: <ul style="list-style-type: none"> <li>a) The qualities and transferable skills necessary for employment requiring: <ul style="list-style-type: none"> <li>i. The exercise of initiative and of personal responsibility and accountability; and</li> <li>ii. Decision-making in complex situations;</li> </ul> </li> <li>b) The intellectual independence required for continuing professional development;</li> <li>c) The ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</li> <li>d) The ability to appreciate the broader implications of applying knowledge to particular contexts.</li> </ul>                                                      |
| <b>Level of Communication Skills</b>     | The ability to communicate ideas, issues and conclusions clearly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Awareness of Limits of Knowledge</b>  | Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 2.2: Relationship between LOs and Master's Level GDLEs**

| <b>Master's Level</b>                                                                                                                                                          | <b>Depth &amp; Breadth of Knowledge</b><br><i>Advanced disciplinary knowledge</i> | <b>Research &amp; Scholarship</b><br><i>a. Research methods comprehension</i> | <i>b. Critical research evaluation</i> | <i>c. Complex issue analysis</i>    | <i>d. Sustained written argument or Original knowledge application</i> | <b>Level of Knowledge Application</b><br><i>Applied research competence</i> | <b>Professional Capacity/Autonomy</b><br><i>a. Initiative &amp; accountability and Complex decision-making</i> | <i>b. Intellectual independence</i> | <i>c. Ethical research conduct</i>  | <i>d. Broader contextual awareness</i> | <b>Communication Skills</b><br><i>Clear communication</i> | <b>Awareness of Knowledge Limits</b><br><i>Knowledge complexity awareness</i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------|-------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>LO1:</b> Synthesize theory, research, and practice to generate innovative, real-world packaging solutions that advance the field and contribute to industry transformation. | <input checked="" type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                           | <input checked="" type="checkbox"/>    | <input checked="" type="checkbox"/> | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input checked="" type="checkbox"/>                                                                            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>               | <input type="checkbox"/>                                  | <input type="checkbox"/>                                                      |
| <b>LO2:</b> Develop innovative packaging solutions that balance performance and sustainability by integrating cutting-edge materials science and packaging design principles   | <input checked="" type="checkbox"/>                                               | <input type="checkbox"/>                                                      | <input type="checkbox"/>               | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input checked="" type="checkbox"/>                                                                            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>               | <input type="checkbox"/>                                  | <input type="checkbox"/>                                                      |
| <b>LO3:</b> Advance sustainable packaging design and production by evaluating complex scientific, technical and regulatory challenges                                          | <input checked="" type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                           | <input checked="" type="checkbox"/>    | <input checked="" type="checkbox"/> | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input checked="" type="checkbox"/>                                                                            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>    | <input type="checkbox"/>                                  | <input checked="" type="checkbox"/>                                           |
| <b>LO4:</b> Conduct independent and collaborative research using qualitative or quantitative methods.                                                                          | <input type="checkbox"/>                                                          | <input checked="" type="checkbox"/>                                           | <input checked="" type="checkbox"/>    | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input type="checkbox"/>                                                    | <input checked="" type="checkbox"/>                                                                            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>    | <input type="checkbox"/>                                  | <input checked="" type="checkbox"/>                                           |
| <b>LO5:</b> Integrate sustainability frameworks into packaging decision-making to strategically minimize environmental and social impacts.                                     | <input checked="" type="checkbox"/>                                               | <input type="checkbox"/>                                                      | <input type="checkbox"/>               | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input type="checkbox"/>                                                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>               | <input type="checkbox"/>                                  | <input checked="" type="checkbox"/>                                           |

| <b>Master's Level</b> | <b>Depth &amp; Breadth of Knowledge</b><br><i>Advanced disciplinary knowledge</i>                                                                              | <b>Research &amp; Scholarship</b><br><i>a. Research methods comprehension</i> | <i>b. Critical research evaluation</i> | <i>c. Complex issue analysis</i>    | <i>d. Sustained written argument or Original knowledge application</i> | <b>Level of Knowledge Application</b><br><i>Applied research competence</i> | <b>Professional Capacity/Autonomy</b><br><i>a. Initiative &amp; accountability and Complex decision-making</i> | <i>b. Intellectual independence</i> | <i>c. Ethical research conduct</i>  | <i>d. Broader contextual awareness</i> | <b>Communication Skills</b><br><i>Clear communication</i> | <b>Awareness of Knowledge Limits</b><br><i>Knowledge complexity awareness</i> |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------|-------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------|
|                       | <b>LO6:</b> Coordinate packaging strategies to meet stakeholder needs by analyzing market trends, consumer behavior, and supply chain dynamics.                | <input type="checkbox"/>                                                      | <input type="checkbox"/>               | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input checked="" type="checkbox"/>                                                                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>    | <input type="checkbox"/>                                  | <input type="checkbox"/>                                                      |
|                       | <b>LO7:</b> Communicate complex scientific information effectively to diverse audiences through written, oral, and visual media.                               | <input type="checkbox"/>                                                      | <input type="checkbox"/>               | <input type="checkbox"/>            | <input checked="" type="checkbox"/>                                    | <input type="checkbox"/>                                                    | <input type="checkbox"/>                                                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>               | <input checked="" type="checkbox"/>                       | <input type="checkbox"/>                                                      |
|                       | <b>LO8:</b> Collaborate with interdisciplinary teams, demonstrating leadership, project management, and ethical decision-making in packaging-related contexts. | <input type="checkbox"/>                                                      | <input type="checkbox"/>               | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input checked="" type="checkbox"/>                                         | <input checked="" type="checkbox"/>                                                                            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>    | <input type="checkbox"/>                                  | <input type="checkbox"/>                                                      |
|                       | <b>LO9:</b> Apply ethical, equitable and accessible reasoning to packaging research and practice.                                                              | <input checked="" type="checkbox"/>                                           | <input type="checkbox"/>               | <input type="checkbox"/>            | <input type="checkbox"/>                                               | <input type="checkbox"/>                                                    | <input type="checkbox"/>                                                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>               | <input type="checkbox"/>                                  | <input checked="" type="checkbox"/>                                           |
|                       | <b>LO10:</b> Optimize packaging systems by utilizing analytical, digital, and technical tools.                                                                 | <input checked="" type="checkbox"/>                                           | <input checked="" type="checkbox"/>    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>                                    | <input type="checkbox"/>                                                    | <input checked="" type="checkbox"/>                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>               | <input type="checkbox"/>                                  | <input type="checkbox"/>                                                      |

**Table 2.3: Doctoral Level Graduate Degree Level Expectations (GDLEs)**

| <b>GDLEs</b>                             | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Depth and Breadth of Knowledge</b>    | A thorough understanding of a substantial body of knowledge that is at the forefront of their academic discipline or area of professional practice, including, where appropriate, relevant knowledge outside the field and/or discipline.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Research and Scholarship</b>          | <ul style="list-style-type: none"> <li>a. The ability to conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems;</li> <li>b. The ability to make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and</li> <li>c. The ability to produce original research, or other advanced scholarship, of a quality to satisfy peer review, and to merit publication.</li> </ul>                   |
| <b>Level of Application of Knowledge</b> | <p>The capacity to</p> <ul style="list-style-type: none"> <li>a. Undertake pure and/or applied research at an advanced level; and</li> <li>b. Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials.</li> </ul>                                                                                                                                                                                                                                                                                                               |
| <b>Professional Capacity/Autonomy</b>    | <ul style="list-style-type: none"> <li>a. The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations;</li> <li>b. The intellectual independence to be academically and professionally engaged and current;</li> <li>c. The ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for the responsible conduct of research; and</li> <li>d. The ability to evaluate the broader implications of applying knowledge to particular contexts.</li> </ul> |
| <b>Level of Communication Skills</b>     | The ability to communicate complex and/or ambiguous ideas, issues and conclusions clearly and effectively.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Awareness of Limits of Knowledge</b>  | An appreciation of the limitations of one's own work and discipline, of the complexity of knowledge, and of the potential contributions of other interpretations, methods, and disciplines.                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Table 2.4: Relationship between LOs and Doctoral Level GDLEs**

| <b>PhD Level</b>                                                                                                                                                      | <b>Depth &amp; Breadth of Knowledge</b><br><i>Forefront disciplinary expertise</i> | <b>Research &amp; Scholarship</b><br><i>a. Original research design</i> | <i>b. Complex specialist judgment</i> | <i>c. Publishable original scholarship</i> | <b>Level of Knowledge Application</b><br><i>a. Advanced research practice</i> | <i>b. Development of professional knowledge</i> | <b>Professional Capacity/Autonomy</b><br><i>a. Autonomous professional initiative</i> | <i>b. Academic &amp; professional independence</i> | <i>c. Ethical research conduct</i> | <i>d. Broader contextual evaluation</i> | <b>Communication Skills</b><br><i>Communicating complex ideas</i> | <b>Awareness of Knowledge Limits</b><br><i>Limits &amp; interdisciplinarity awareness</i> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------|-----------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>LO1:</b> Generate original knowledge and theoretical contributions that advance the field of packaging science.                                                    | <input checked="" type="checkbox"/>                                                | <input type="checkbox"/>                                                | <input type="checkbox"/>              | <input checked="" type="checkbox"/>        | <input type="checkbox"/>                                                      | <input type="checkbox"/>                        | <input type="checkbox"/>                                                              | <input type="checkbox"/>                           | <input type="checkbox"/>           | <input type="checkbox"/>                | <input type="checkbox"/>                                          | <input type="checkbox"/>                                                                  |
| <b>LO2:</b> Design and conduct independent, high-impact research addressing complex challenges in packaging systems, materials, and sustainability.                   | <input type="checkbox"/>                                                           | <input checked="" type="checkbox"/>                                     | <input type="checkbox"/>              | <input checked="" type="checkbox"/>        | <input checked="" type="checkbox"/>                                           | <input type="checkbox"/>                        | <input type="checkbox"/>                                                              | <input type="checkbox"/>                           | <input type="checkbox"/>           | <input type="checkbox"/>                | <input type="checkbox"/>                                          | <input type="checkbox"/>                                                                  |
| <b>LO3:</b> Lead interdisciplinary research initiatives which collaborate across academic, industry, and policy contexts.                                             | <input checked="" type="checkbox"/>                                                | <input type="checkbox"/>                                                | <input checked="" type="checkbox"/>   | <input type="checkbox"/>                   | <input type="checkbox"/>                                                      | <input type="checkbox"/>                        | <input type="checkbox"/>                                                              | <input checked="" type="checkbox"/>                | <input type="checkbox"/>           | <input type="checkbox"/>                | <input type="checkbox"/>                                          | <input checked="" type="checkbox"/>                                                       |
| <b>LO4:</b> Create solutions to environmental and societal challenges by integrating sustainability, systems thinking, and global perspectives into applied research. | <input type="checkbox"/>                                                           | <input checked="" type="checkbox"/>                                     | <input checked="" type="checkbox"/>   | <input type="checkbox"/>                   | <input checked="" type="checkbox"/>                                           | <input checked="" type="checkbox"/>             | <input type="checkbox"/>                                                              | <input type="checkbox"/>                           | <input type="checkbox"/>           | <input type="checkbox"/>                | <input type="checkbox"/>                                          | <input type="checkbox"/>                                                                  |

| PhD Level                                                                                                                                                     | <b>Depth &amp; Breadth of Knowledge</b><br><i>Forefront disciplinary expertise</i> | <b>Research &amp; Scholarship</b><br><i>a. Original research design</i> | <i>b. Complex specialist judgment</i> | <i>c. Publishable original scholarship</i> | <b>Level of Knowledge Application</b><br><i>a. Advanced research practice</i> | <i>b. Development of professional knowledge</i> | <b>Professional Capacity/Autonomy</b><br><i>a. Autonomous professional initiative</i> | <i>b. Academic &amp; professional independence</i> | <i>c. Ethical research conduct</i>  | <i>d. Broader contextual evaluation</i> | <b>Communication Skills</b><br><i>Communicating complex ideas</i> | <b>Awareness of Knowledge Limits</b><br><i>Limits &amp; interdisciplinarity awareness</i> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------|-----------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>LO5:</b> Lead the dissemination and mobilization of research findings to influence scholarly, industry, policy, and public discourse in packaging science. | <input type="checkbox"/>                                                           | <input type="checkbox"/>                                                | <input type="checkbox"/>              | <input type="checkbox"/>                   | <input type="checkbox"/>                                                      | <input type="checkbox"/>                        | <input checked="" type="checkbox"/>                                                   | <input checked="" type="checkbox"/>                | <input type="checkbox"/>            | <input type="checkbox"/>                | <input checked="" type="checkbox"/>                               | <input type="checkbox"/>                                                                  |
| <b>LO6:</b> Design and innovate research that is informed by ethical practices including equity, diversity, inclusion and accessibility frameworks.           | <input checked="" type="checkbox"/>                                                | <input type="checkbox"/>                                                | <input type="checkbox"/>              | <input type="checkbox"/>                   | <input type="checkbox"/>                                                      | <input type="checkbox"/>                        | <input type="checkbox"/>                                                              | <input type="checkbox"/>                           | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>     | <input type="checkbox"/>                                          | <input checked="" type="checkbox"/>                                                       |

## 2.3 Admission requirements

Admission to the proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science will be based on a holistic assessment of academic preparation, research potential, and alignment with the programs' interdisciplinary focus. The programs are designed to attract applicants from Graphic Communications Management (GCM) as well as related disciplines such as materials science, engineering, environmental science, chemistry, supply chain management, and design.

### General Admission Requirements (Applicable to MSc and PhD)

- **Minimum Academic Standing (GPA Requirement)**

Applicants must have achieved a minimum academic standing consistent with the requirements of Toronto Metropolitan University's Senate Policies.

This requirement ensures that students have the academic foundation necessary to succeed in advanced coursework and research, supporting learning outcomes related to critical analysis, application of technical knowledge, and independent research.

- **English Language Proficiency**

Applicants whose first language is not English, or who have not completed a degree at an institution where English is the primary language of instruction, must provide proof of English language proficiency in accordance with TMU/YSGPS requirements (e.g., TOEFL, IELTS, or equivalent). Minimum acceptable scores typically include:

- IELTS (Academic): Minimum overall score of 7.0, with no band below 6.5
- TOEFL (iBT): Minimum total score of 93
- Duolingo: 130

Equivalent scores from other recognized tests may also be accepted in accordance with university policies.

Demonstrated proficiency in English supports learning outcomes related to effective communication, academic writing, and participation in research and collaborative environments.

### Master of Science (MSc) Admission Requirements

Applicants to the MSc program will hold a four-year undergraduate degree from an accredited institution with academic standing consistent with Toronto Metropolitan University's graduate admission requirements.

- **Academic Background (Degree Requirement)**

This requirement ensures that students possess the foundational knowledge necessary to engage with advanced coursework in packaging science, sustainability frameworks,

and analytical methods. It supports learning outcomes related to applying packaging design principles, evaluating technical knowledge, and utilizing analytical tools.

- **Official Academic Transcripts**

Transcripts provide evidence of prior academic performance and relevant coursework. They allow the admissions committee to assess preparation in scientific, technical, or design-related fields, supporting learning outcomes related to critical evaluation of knowledge and the application of analytical and technical tools. MSc applicants will normally hold a four-year undergraduate degree from an accredited institution, with a minimum cumulative average equivalent to a B (or 3.0/4.33) in the last two years of study, in accordance with the university's graduate admission requirements.

- **Statement of Research Interests**

Applicants will submit a statement outlining intended research areas, elaboration on their past relevant publications/experiences, and alignment with faculty expertise. This requirement assesses alignment with the program's interdisciplinary and sustainability focus and supports learning outcomes related to synthesizing theory and practice, integrating sustainability frameworks, and developing innovative solutions.

- **Two Letters of Reference**

Reference letters assess academic ability, research potential, and collaborative skills. They support evaluation of competencies such as critical thinking, independent learning, and teamwork, which align with learning outcomes related to research, communication, and interdisciplinary collaboration.

## Doctor of Philosophy (PhD) Admission Requirements

Applicants to the PhD program will normally hold a relevant master's degree (or equivalent) with strong academic standing and demonstrated research excellence.

- **Academic Background (Master's Degree Requirement)**

This requirement ensures advanced disciplinary knowledge and research preparation, supporting learning outcomes related to generating original knowledge, critically synthesizing literature, and conducting independent research.

- **Transfer from MSc to PhD (Internal Pathway)**

Students enrolled in the MSc in Packaging Science may be considered for transfer to the PhD program after successful completion of at least one year of full-time study, subject to demonstrating exceptional academic performance and strong research potential.

Transfer will require:

- Evidence of outstanding academic achievement in graduate coursework in compliance with policy 170(b), which requires completion of all course requirements for the Master's degree with a minimum GPA of 3.67.
- A clearly defined and feasible doctoral research direction appropriate for a doctoral level research, approved by the student's supervisor or supervisory committee, and the Graduate Program Director (GPD).

- Approval of transfer will be based on a strong recommendation from the student's supervisor or supervisory committee, and approval of the Graduate Program Director (GPD), in accordance with university policies.
- **Official Academic Transcripts**  
Transcripts demonstrate sustained academic excellence and preparation in relevant fields. They support assessment of readiness for advanced research and alignment with learning outcomes related to depth and breadth of knowledge. PhD applicants will normally hold a relevant master's degree (or equivalent), with demonstrated research excellence and potential for independent scholarship, with a minimum academic standing equivalent to a B+ (or 3.3/4.33) in graduate-level coursework, in accordance with university graduate admission requirements.
- **Statement of Research Interests / Research Proposal**  
Applicants will submit a detailed statement (or preliminary research proposal) outlining intended research areas, elaboration on their past relevant publications/experiences, and alignment with faculty expertise. This requirement directly supports learning outcomes related to designing independent research, advancing knowledge, and addressing complex challenges in packaging science.
- **Two Letters of Reference**  
References evaluate research capability, intellectual independence, and readiness for doctoral-level work. They align with learning outcomes related to leadership in research, critical thinking, and scholarly contribution.

## Alignment with Learning Outcomes

Together, these admission requirements ensure that applicants possess the academic preparation, research capacity, and interdisciplinary perspective necessary to achieve the learning outcomes of the MSc and PhD in Packaging Science. The criteria are designed to identify candidates who demonstrate strong potential for innovation, research excellence, and leadership in addressing complex packaging challenges within industry, academia, and broader societal contexts.

## 2.4 Program calendar

Calendar template

### PROGRAM NAME

*For each degree/field, include all required pieces of the curriculum, including seminars, thesis, MRP, etc, in a table format. For example:*

#### Degree Requirement for Master of Science in Packaging Science (MSc)

| DEGREE REQUIREMENTS | Credits |
|---------------------|---------|
|---------------------|---------|

|         |                                       |           |
|---------|---------------------------------------|-----------|
|         | Master's Thesis                       | Milestone |
| PKG#### | Master's Research Seminar             | Pass/Fail |
| PKG#### | Research Methods in Packaging Science | 1         |
| PKG#### | Advanced Packaging Materials          | 1         |
|         | Two (2) electives                     | 2         |

### Degree Requirement for Doctor of Philosophy in Packaging Science (PhD)

| DEGREE REQUIREMENTS |                                        | Credits   |
|---------------------|----------------------------------------|-----------|
|                     | Candidacy exam                         | Milestone |
|                     | Doctoral Dissertation                  | Milestone |
| PKG####             | Doctoral Research Seminar              | Pass/Fail |
| PKG####             | Research Methods in Packaging Science* | 1         |
| PKG####             | Advanced Packaging Materials*          | 1         |
|                     | Two (2) electives                      | 2         |

\* Students who took these courses previously would substitute them with electives.

### Elective Courses

| Code    | Title                                            | Credits |
|---------|--------------------------------------------------|---------|
| PKG#### | Sustainable Packaging Systems and Design         | 1       |
| PKG#### | Consumer Behaviour in Packaging                  | 1       |
| PKG#### | Packaging Print and Production                   | 1       |
| PKG#### | Food and Pharmaceutical Packaging                | 1       |
| PKG#### | Inclusive Packaging Design                       | 1       |
| PKG#### | Packaging Dynamics                               | 1       |
| PKG#### | Directed Studies: Packaging Science (MSc)        | 1       |
| PKG#### | Directed Studies: Packaging Science (PhD)        | 1       |
|         | An approved course from another graduate program | 1       |

## **COURSE LISTING**

### Master's Thesis

Students are required to conduct advanced research. The topic is chosen in consultation with the student's supervisor(s). The student must submit the completed research in a thesis format to an examination committee and make an oral presentation and defence of the research thesis and results to this committee. Through the thesis, students are expected to demonstrate competence in research and a sound understanding of the specialty area associated with the research. This is a "Milestone." Pass/Fail

### Doctoral Candidacy Examination

The Candidacy Examination is a mandatory milestone intended to evaluate a student's readiness to undertake independent doctoral research in packaging science. The examination assesses the student's ability to critically synthesize relevant literature, demonstrate advanced disciplinary and methodological knowledge, and articulate a rigorous and original research plan. The candidacy process will include written and oral components evaluated by a supervisory and examination committee in accordance with university policies and program requirements. Successful completion of the candidacy examination confirms that the student has demonstrated the scholarly, analytical, and research competencies required to proceed to the dissertation stage of the program. This is a "Milestone." Pass/Fail.

### PhD's Dissertation

Students are required to conduct advanced, independent, and original research that makes a significant contribution to knowledge in packaging science, under the supervision of a faculty member. The topic is chosen in consultation with the student's supervisor(s). The completed research is submitted as a doctoral dissertation and defended orally before an examination committee. The dissertation must demonstrate originality, rigorous analysis, advanced theoretical and methodological understanding, and effective communication of complex ideas. This is a "Milestone." Pass/Fail

### PKG#### Master's Research Seminar

The Research Seminar is a mandatory requirement designed to support the development of research communication and scholarly engagement. Students participate in regular seminar activities, including presentations, discussions, and critical review of ongoing research in packaging science. Through the seminar, students are expected to develop the ability to communicate research effectively, engage with interdisciplinary perspectives, and contribute to an active research community. Students are required to deliver at least one research presentation and attend at least 80% of the seminars. Pass/Fail.

### PKG#### Doctoral Research Seminar

The Research Seminar is a mandatory, non-credit, Pass/Fail requirement designed to support the development of research communication and scholarly engagement. Students participate in

regular seminar activities, including presentations, discussions, and critical review of ongoing research in packaging science. Through the seminar, students are expected to develop the ability to communicate research effectively, engage with interdisciplinary perspectives, and contribute to an active research community. Students are required to deliver at least two presentations and attend at least 80% of the seminars. Pass/Fail.

#### PKG#### Research Methods in Packaging Science

This course provides graduate students with advanced research training in packaging science and related interdisciplinary fields. Students will examine qualitative, quantitative, and mixed-methods research approaches used to investigate complex challenges in packaging materials, packaging systems, sustainability, consumer behaviour, and supply chain applications. The course emphasizes research design, critical analysis of scholarly literature, experimental planning, data collection and interpretation, ethical research practices, and knowledge mobilization. Students will develop the ability to formulate research questions, evaluate scientific and technical evidence, select appropriate methodologies, and communicate research findings to academic and professional audiences. The course also introduces analytical, digital, and technical tools commonly used in packaging research and supports the development of independent and collaborative research competencies required for advanced graduate study and innovation in packaging science.

#### PKG#### Advanced Packaging Materials

This course provides an advanced study of packaging materials, focusing on their physical, chemical, and functional properties in relation to performance requirements and structure–property relationships. Topics include durability, barrier properties, processing behaviour, recycling and end-of-life considerations, as well as emerging packaging technologies such as sustainable, smart, nano-enabled, and biomedical packaging.

#### PKG#### Sustainable Packaging Systems and Design

This course examines the design and evaluation of packaging systems from a sustainability and systems perspective. The course covers packaging–product interactions, material selection, structural and functional design, manufacturing and distribution considerations, and end-of-life strategies. Emphasis is placed on design methodologies, performance evaluation, and trade-off analysis to develop sustainable packaging solutions.

#### PKG#### Consumer Behavior in Packaging

This course examines how consumers perceive, interact with, and respond to packaging across physical and digital contexts. The course covers theories and methods related to perception, cognition, usability, decision-making, and human-package interaction, with emphasis on packaging design, information communication, accessibility, and sustainability. Advanced qualitative and quantitative research methods are introduced to analyze consumer behaviour and to inform evidence-based packaging design and evaluation.

#### PKG#### Package Printing and Production

This course provides an advanced study of printing technologies and production systems for packaging applications. The course examines print substrates, inks, coatings, and functional materials; advanced printing and finishing processes; colour management, process control, and quality assurance; and integration of printing with packaging, converting and manufacturing workflows. Emphasis is placed on system optimization, performance evaluation, and emerging technologies in advanced packaging, printing and production.

#### PKG#### Food and Pharmaceutical Packaging

This course examines food and pharmaceutical packaging systems with an emphasis on product protection, safety, regulatory compliance, and sustainability. Topics include packaging materials and structures, barrier performance, active and intelligent packaging, sterility and contamination control, shelf-life extension, and emerging technologies. Through case studies and applied research, students integrate scientific, technical, regulatory, and market considerations to address real-world packaging challenges.

#### PKG#### Inclusive Packaging Design

This course explores how inclusive design principles and frameworks can be applied to packaging design to create accessible packages that consider the needs of diverse consumer groups, including the most vulnerable in society. Students will work with various stakeholders to identify the needs of relevant consumer groups, develop and test the packaging design, and make further improvements based on their consumers' and stakeholders' feedback.

#### PKG#### Packaging Dynamics

This course focuses on advanced analysis of mechanical and environmental hazards experienced by packaging systems during physical distribution. The course examines distribution environments and supply chains, advanced principles of protective packaging design, and the mechanical response of packaging materials and systems under shock, vibration, compression, and climatic stresses. Advanced measurement, instrumentation, modelling, and standardized testing methods used to evaluate packaging performance and quality are also covered.

#### PKG#### Directed Studies: Packaging Science (MSc)

This course provides students with the opportunity to undertake an individualized program of study under the supervision of a faculty member, focusing on a specialized topic in packaging science aligned with their research interests. Through guided independent study, students engage with advanced literature, analytical methods, and applied problem-solving in areas such as materials, packaging design, sustainability, or consumer behaviour. The course may include a combination of literature review, technical analysis, and/or a small research project, culminating in a written report or equivalent scholarly output. This course enables students to deepen their expertise and supports preparation for thesis research.

## PKG#### Directed Studies: Packaging Science (PhD)

This course enables doctoral students to pursue advanced, specialized study in a focused area of packaging science under the supervision of a faculty member. Designed to support doctoral research, the course emphasizes critical analysis of complex literature, development of theoretical or methodological frameworks, and exploration of emerging or interdisciplinary topics. Students may undertake advanced research activities that contribute directly to their dissertation, such as conceptual development, methodological design, or pilot studies. The course culminates in a substantial scholarly output, demonstrating originality, depth of analysis, and alignment with doctoral-level expectations.

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*Calendar template*

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## 2.5 Mapping of curriculum to learning outcomes

### MSc in Packaging Science

The following table presents the curriculum map for the MSc in Packaging Science, indicating where the program learning outcomes are Foundational (F) and Proficient (P) throughout the program. The map demonstrates a deliberate progression in which students gradually develop the knowledge, research skills, and applied competencies required to meet the program's learning outcome.

**Table 2.7: Mapping of MSc curriculum to learning outcomes.**

|          |        |           |                                          | LO1 |   | LO2 |   | LO3 |   | LO4 |   | LO5 |   | LO6 |   | LO7 |   | LO8 |   | LO9 |   | LO10 |   |
|----------|--------|-----------|------------------------------------------|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|------|---|
|          |        | Code      | Course Name                              | F   | P | F   | P | F   | P | F   | P | F   | P | F   | P | F   | P | F   | P | F   | P | F    | P |
| Core     | Year 1 | PKG####   | Research Methods in Packaging Science    | X   |   |     |   |     |   | X   |   |     |   |     |   | X   | X |     | X |     | X |      |   |
| Core     | Year 1 | PKG####   | Advanced Packaging Materials             | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   |     | X |     |   |     |   | X    |   |
| Core     | Year 2 | Milestone | Research Seminar                         | X   |   | X   |   | X   |   | X   | X |     |   |     |   | X   |   | X   | X |     |   |      |   |
| Core     | Year 2 | Milestone | Master’s Thesis                          |     | X | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X    |   |
| Elective | Year 1 | PKG####   | Sustainable Packaging Systems and Design | X   |   | X   |   | X   | X |     |   | X   |   |     | X |     |   |     |   |     |   | X    |   |
| Elective | Year 1 | PKG####   | Consumer Behaviour in Packaging          |     | X | X   |   |     |   | X   | X |     |   | X   | X |     | X |     |   | X   |   | X    |   |
| Elective |        | PKG####   | Package Printing and Production          | X   |   | X   |   | X   |   |     |   | X   |   |     |   |     |   |     |   |     |   | X    |   |
| Elective |        | PKG####   | Food and Pharmaceutical Packaging        | X   |   | X   |   | X   |   |     | X |     |   |     |   |     | X |     |   |     | X |      |   |
| Elective |        | PKG####   | Inclusive Packaging Design               | X   |   |     |   |     |   | X   |   |     | X |     | X |     |   |     |   | X   | X |      |   |
| Elective |        | PKG####   | Packaging Dynamics                       | X   |   | X   |   | X   | X |     | X |     |   | X   |   |     |   |     |   |     | X |      |   |
| Elective |        | PKG####   | Direct Studies: Packaging Science (MSc)  | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   |      |   |

F: Foundational; P: Proficient.

The following table outlines the typical progression of the MSc in Packaging Science over two years (six terms), with coursework concentrated in Year 1, research presentation and thesis research in Year 2.

**Table 2.5: Timetable for the coursework for the MSc in Packaging Science program.**

| Year   | Term                   | Course / Milestone                                | Credits   |
|--------|------------------------|---------------------------------------------------|-----------|
| Year 1 | Fall (Term 1)          | Research Methods in Packaging Science             | 1         |
|        |                        | Elective                                          | 1         |
|        |                        | Master's Research Seminar                         | Pass/Fail |
|        |                        | Begin research exploration with supervisor        |           |
|        | Winter (Term 2)        | Advanced Packaging Materials                      | 1         |
|        |                        | Elective                                          | 1         |
|        |                        | Master's Research Seminar                         | Pass/Fail |
|        | Spring/Summer (Term 3) | Thesis proposal development and literature review |           |
| Year 2 | Fall (Term 4)          | Master's Research Seminar                         | Pass/Fail |
|        |                        | Master's Thesis Research                          |           |
|        | Winter (Term 5)        | Master's Research Seminar                         | Pass/Fail |
|        |                        | Master's Thesis Research                          |           |
|        | Spring/Summer (Term 6) | Master's Thesis completion and oral defence       | Milestone |

In Year 1, students complete two required core courses, Research Methods in Packaging Science and Advanced Packaging Materials, which establish the scientific, technical, and methodological foundations of the program. Research Methods develops competencies in research design, analytical methods, literature evaluation, and qualitative and quantitative methodologies that support independent graduate research. Advanced Packaging Materials focuses on packaging materials, packaging performance, materials characterization, and analytical and technical tools used in packaging science. Students also complete two elective courses that allow them to deepen their expertise in specialized areas such as sustainable packaging systems and design, consumer behaviour in packaging, package printing and production, food and pharmaceutical packaging, inclusive packaging design, or packaging dynamics. Because students may complete different elective pathways, the curriculum is designed so that elective coursework collectively supports achievement of the program learning

outcomes while allowing students to align their studies with individual research interests. During Year 1, students also begin research exploration with their supervisor and develop their thesis proposal and literature review.

Throughout both Year 1 and Year 2, students are required to participate in the Master's Research Seminar, a non-credit, Pass/Fail component that supports ongoing scholarly engagement, research communication, interdisciplinary discussion, and professional development within packaging science. As part of the seminar requirement, students must deliver at least one research presentation, typically during Year 2, demonstrating their ability to communicate research findings to academic and professional audiences.

In Year 2, students are primarily engaged in Master's Thesis research under faculty supervision. The Master's Thesis serves as the program's primary milestone, requiring students to integrate theoretical knowledge, sustainability principles, and research methodologies to investigate a complex packaging-related challenge. Through the thesis, students demonstrate proficiency in independent research, analytical and technical problem-solving, interdisciplinary collaboration, and the effective communication of research findings through a written thesis and oral defence.

Overall, the curriculum progression moves students from foundational knowledge and applied skill development in Year 1 to advanced research integration and independent scholarship in Year 2, ensuring that graduates achieve the Graduate Degree Level Expectations for a Master of Science degree regardless of elective pathway selection.

## PhD in Packaging Science

The curriculum of the Doctor of Philosophy (PhD) in Packaging Science is designed to support the development of advanced research, analytical, and scholarly competencies required at the doctoral level. The curriculum map identifies where learning outcomes are Foundational (F) and Proficient (P). The program follows a structured progression in which students build on prior graduate-level knowledge (e.g., MSc or equivalent), engage in advanced coursework to deepen and extend expertise, and then transition to independent, original research culminating in the doctoral dissertation. Key milestones, including the Research Seminar, Candidacy Examination, and Doctoral Dissertation, play a central role in achieving doctoral-level proficiency across all learning outcomes.

**Table 2.8: Mapping of PhD curriculum to learning outcomes.**

|          |        |             |                                                 | LO1 |   | LO2 |   | LO3 |   | LO4 |   | LO5 |   | LO6 |   |
|----------|--------|-------------|-------------------------------------------------|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|
|          |        | Code        | Course Name                                     | F   | P | F   | P | F   | P | F   | P | F   | P | F   | P |
| Core     | Year 2 | Milestone A | <b>Research Seminar</b>                         | X   |   |     | X |     | X | X   |   |     | X | X   |   |
| Core     | Year 2 | Milestone B | <b>Candidacy Examination</b>                    |     | X |     | X | X   |   | X   |   |     | X | X   |   |
| Core     | Year 4 | Milestone C | <b>Doctoral Dissertation</b>                    |     | X |     | X |     | X |     | X |     | X |     | X |
| Core     | Year 1 | PKG####     | <b>Research Methods in Packaging Science</b>    | X   |   | X   |   | X   |   |     |   |     | X | X   |   |
| Core     | Year 1 | PKG####     | <b>Advanced Packaging Materials</b>             | X   |   | X   |   | X   |   |     | X |     |   |     |   |
| Elective | Year 2 | PKG####     | <b>Sustainable Packaging Systems and Design</b> | X   |   | X   |   |     |   | X   |   | X   |   |     |   |
| Elective | Year 2 | PKG####     | <b>Consumer Behaviour in Packaging</b>          | X   |   |     | X | X   |   | X   |   | X   |   |     | X |
| Elective |        | PKG####     | <b>Package Printing and Production</b>          | X   |   |     |   |     |   | X   |   |     |   |     |   |
| Elective |        | PKG####     | <b>Food and Pharmaceutical Packaging</b>        | X   |   |     |   | X   |   | X   |   |     |   |     |   |
| Elective |        | PKG####     | <b>Inclusive Packaging Design</b>               | X   |   |     | X |     |   |     |   | X   |   |     | X |
| Elective |        | PKG####     | <b>Packaging Dynamics</b>                       | X   |   | X   |   |     |   | X   |   |     |   |     |   |
| Elective |        | PKG####     | <b>Direct Studies: Packaging Science (PhD)</b>  | X   |   | X   |   | X   |   | X   |   | X   |   | X   |   |

F: Foundational; P: Proficient.

The following table outlines the typical progression of the PhD in Packaging Science over four years (12 terms), with coursework concentrated in Years 1 and 2, research presentations in Years 1 and 2, candidacy exam in Year 2 and dissertation research in Year 4.

**Table 2.6: Timetable for the coursework for the PhD in Packaging Science program.**

| Year   | Term                   | Course / Milestone                                   | Credits   |
|--------|------------------------|------------------------------------------------------|-----------|
| Year 1 | Fall (Term 1)          | Research Methods in Packaging Science or an elective | 1         |
|        |                        | Doctoral Research Seminar                            | Pass/Fail |
|        |                        | Begin research planning with the supervisor          |           |
|        | Winter (Term 2)        | Advanced Packaging Materials or an elective          | 1         |
|        |                        | Research Seminar                                     | Pass/Fail |
|        | Spring/Summer (Term 3) | Literature review and research development           |           |
| Year 2 | Fall (Term 4)          | Elective                                             | 1         |
|        |                        | Research Seminar                                     |           |
|        |                        | Candidacy Examination                                | Milestone |
|        | Winter (Term 5)        | Elective                                             | 1         |
|        |                        | Research Seminar                                     | Pass/Fail |
|        | Spring/Summer (Term 6) | Dissertation research                                |           |
| Year 3 | Fall (Term 7)          | Research Seminar                                     | Pass/Fail |
|        |                        | Dissertation research                                |           |
|        | Winter (Term 8)        | Research Seminar                                     | Pass/Fail |
|        |                        | Dissertation research                                |           |
|        | Spring/Summer (Term 9) | Dissertation research                                |           |
| Year 4 | Fall (Term 10)         | Research Seminar                                     | Pass/Fail |
|        |                        | Dissertation research                                |           |
|        | Winter (Term 11)       | Research Seminar                                     | Pass/Fail |

|  |                         |                               |           |
|--|-------------------------|-------------------------------|-----------|
|  |                         | Dissertation research         |           |
|  | Spring/Summer (Term 12) | Doctoral dissertation defence | Milestone |

At the doctoral level, students are expected to enter the program with prior foundational knowledge in packaging science or a related discipline. As such, the curriculum is designed to support progression from foundational to proficient achievement of the program learning outcomes through advanced coursework, research development, scholarly engagement, and independent dissertation research.

In Years 1–2, students complete advanced coursework selected from Group I (Core), Group II (Electives), Directed Studies, or approved graduate courses. These courses reinforce and deepen knowledge in packaging materials, packaging design, sustainability, and research methodologies, while supporting learning outcomes related to critical analysis, interdisciplinary thinking, and advanced technical skills.

The Research Seminar, which spans all Fall and Winter terms, provides a continuous platform for intellectual engagement, scholarly communication, and research dissemination. Students are assessed through active participation, critical discussion of research literature, seminar engagement, and formal research presentations. Through these activities, students progressively develop proficiency in scholarly communication, research leadership, interdisciplinary collaboration, and knowledge mobilization.

The Candidacy Examination, typically completed in Year 2, represents a key transition point in the program. At this stage, students demonstrate readiness to undertake independent doctoral research by synthesizing knowledge, articulating research questions, and applying advanced methodologies. The candidacy milestone marks proficiency in core research and analytical learning outcomes.

Following candidacy, students focus primarily on independent dissertation research, where they integrate and apply advanced knowledge and skills to generate original contributions to the field of packaging science. The Doctoral Dissertation serves as the final milestone, demonstrating full proficiency across all program learning outcomes, including research excellence, leadership, ethical practice, and knowledge mobilization.

Overall, the PhD curriculum is designed to support a progression from advanced coursework and research development to independent, high-impact research. The structured integration of coursework, seminar engagement, candidacy, and dissertation ensures that graduates achieve doctoral-level learning outcomes and are prepared for leadership roles in academia, industry, and policy.

## 2.6 Rationale for proposed mode of delivery and program length

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science will be delivered through a combination of lectures, seminars, laboratory-based learning,

experiential projects, and research-based learning. This integrated delivery model ensures that students develop both advanced theoretical knowledge and applied research skills required to achieve the program-level learning outcomes.

## Mode of Delivery

Core courses in the MSc program will primarily use lecture and seminar formats to introduce advanced concepts in packaging materials, packaging design, sustainability frameworks, consumer behaviour, and packaging systems. These formats support learning outcomes related to synthesizing theory and practice, critically evaluating technical and regulatory knowledge, and integrating sustainability principles into decision-making.

Laboratory and applied learning components will be incorporated into several courses, allowing students to work directly with packaging materials, testing methods, and design tools. Hands-on learning in areas such as materials performance, packaging dynamics, and production processes will enable students to apply analytical and technical tools to model, test, and optimize packaging systems. These approaches support the development of practical competencies and reinforce learning outcomes related to technical expertise and problem-solving.

The programs will also emphasize experiential and research-based learning, including case studies, industry-informed projects, and collaboration with faculty researchers and industry partners. These activities enable students to address real-world packaging challenges, analyze consumer behaviour and market dynamics, and develop innovative solutions aligned with sustainability and circular economy principles.

For the MSc program, a central component is the master's thesis, which enables students to conduct independent research using qualitative and quantitative methods, develop advanced analytical skills, and communicate complex findings.

For the PhD program, learning is primarily research-intensive, with limited formal coursework and a strong emphasis on independent, original research under faculty supervision. Doctoral students will engage in advanced research design, interdisciplinary collaboration, and knowledge mobilization activities, culminating in a dissertation that contributes new knowledge to the field of packaging science.

Courses and research activities will be delivered primarily in person, particularly to support laboratory work, collaborative learning, and engagement with faculty and industry partners. Where appropriate, selected components, such as seminars, guest lectures, and research meetings, may be offered in hybrid or virtual formats to facilitate participation from external experts and collaborators. These formats will complement in-person delivery and ensure that all program-level learning outcomes are fully achieved.

## Program Length

The MSc program will be structured as a two-year (maximum three-year), full-time degree, consisting of coursework in the first year followed by thesis research in the second year. This timeline provides sufficient depth of study and research experience to achieve the expected learning outcomes related to advanced knowledge, applied research, and professional skill development.

The PhD program is expected to be completed in four years (maximum six years) of full-time study. The program will include coursework and milestone requirements including research seminars, candidacy exam, and the completion of a doctoral dissertation. This duration is consistent with doctoral programs in related fields and allows for the development of original, high-impact research, as well as the acquisition of advanced research, leadership, and scholarly communication skills.

Overall, the proposed modes of delivery and program lengths are appropriate to the objectives of the MSc and PhD in Packaging Science. They provide a balanced and rigorous framework that enables students to achieve the program's learning outcomes while preparing them for professional, academic, and research leadership roles.

## 2.7 Anticipated enrollment

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science anticipate a phased and sustainable enrollment model.

### Planned/Anticipated Intakes per Year

The MSc program anticipates an initial cohort of approximately 10–15 students per year. The PhD program is expected to begin with a smaller cohort of approximately 3–5 students per year, reflecting its research-intensive nature and supervisory capacity.

### Number of Admission Cycles per Year

Admissions will occur once annually, in the Fall term, for the master program to smooth progression through the program and two admission cycles in the Fall and Winter terms for the PhD program, providing flexibility for applicants and supporting steady program growth. The offered courses do not require prerequisites or knowledge from other courses within the program, and thus, the order does not matter.

### Program Delivery Format (Full-time/Part-time)

Both the MSc and PhD programs will be offered only on a full-time basis, reflecting their strong research focus and thesis/dissertation requirements. Full-time enrollment will enable students to fully engage in coursework, research activities, and collaboration with faculty and industry partners.

## Domestic and International Enrollment

At steady state, the programs expect that approximately 80% of enrolled students will be domestic and 20% international, reflecting both the programs' national relevance and the global importance of packaging science and innovation.

## 3 Resources

### 3.1 Students

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science are both research-based programs that include required Scholarly Research and Creative (SRC) components for degree completion.

- The MSc program requires completion of a master's thesis, which serves as the primary milestone of the degree. Students will conduct independent research under the supervision of a faculty member and demonstrate the ability to apply scientific methods, analytical tools, and sustainability frameworks to a complex packaging-related challenge. The thesis will culminate in a written document and an oral defence before an examination committee.
- The PhD program requires completion of a doctoral dissertation that makes a significant original contribution to packaging science. Doctoral students will conduct advanced, independent research under faculty supervision, culminating in a written dissertation and oral defence in accordance with university policies.

### Financial Support and Student Funding

Financial support for students will be available through a combination of institutional, faculty-based, and external funding sources.

- Stipend: Faculty members associated with the programs maintain active research agendas and may provide stipends linked to funded projects in areas such as sustainable materials, packaging systems, consumer behaviour, and packaging technologies. This is estimated to be \$15,000 per year for four years for PhD students and \$12,000 per year for two years for master students.
- Academic Assistantships (AA): Graduate students may have access to academic assistantship opportunities for the undergraduate programs within the School of Graphic Communications Management (totalling around 3,000 hours per year for all students) and related programs such as faculty wide courses (totalling around 3,000 hours per year), currently filled with senior undergraduate students and graduate students from other programs. Also, there will be AA opportunities for PhD students for the proposed graduate courses (totalling around 500 hours per year). Assuming about 32 (20 for master's and 12 for PhD programs) enrolled students in both proposed programs, every student in the program is estimated to have around 200 hours (equivalent to \$10,000) of AA annually.
- External Scholarships and Awards: Students will be encouraged and supported to apply for external funding, including federal and provincial funding programs (e.g., [Ontario Graduate Scholarship](#), [Canada Graduate Research Scholarship](#), tri-agency scholarships) and other competitive awards. It is estimated that 10-15% of master's

students and 25-30% of PhD students can secure such scholarships and awards valued at minimum \$15,000 per year.

- Internal Scholarships and Awards: students in the program will automatically be considered for internal funding provided by YSGPS in the form of scholarships and awards(e.g., TMU Graduate Scholarship). It is estimated that 10-15% of the students can secure such scholarships and awards valued at about \$15,000 per year. In addition, as a Ministry approved and funded program, it will receive funding on an eligible domestic FTE basis to support its students. Eligibility for funding is for a maximum of two years (approximately \$3,400 per year) in the two-year Master's program and four years (approximately \$7,000 per year) for the PhD program. Industry-Supported
- Research Opportunities: The School of Graphic Communications Management maintains strong relationships with industry partners that may provide opportunities for industry-sponsored research projects, internships, and applied research collaborations in areas such as sustainable packaging, advanced manufacturing, packaging technologies, and consumer-focused packaging innovation. Graduate students may also benefit from participation in programs such as [Mitacs Accelerate](#) and [TiCAN](#), which supports collaborative research internships between graduate students and industry or community partners. Through these programs, MSc and PhD students may receive a minimum of approximately \$20,000 per year in internship and research support, depending on the structure and duration of the project and matching partner contributions. These opportunities provide students with applied research experience, professional industry engagement, and additional financial support while strengthening university-industry collaboration and knowledge mobilization within the packaging sector. It is estimated that 20-30% of the students can secure such opportunities.
- International Scholarships and Sponsorships: International students may also access financial support through scholarships, government sponsorships, exchange programs and industry-funded graduate education programs available in Canada and their home countries. These opportunities may include national research scholarships, ministry-sponsored international study programs (e.g., [Mitacs Globalink](#), [Scholarships and Educational Exchanges for Development – Phase 2 \(SEED-2\)](#)), faculty development funding, and employer-supported graduate education initiatives from academic, industrial, or governmental organizations. Such funding pathways are particularly common in regions with growing investments in sustainability, advanced manufacturing, packaging technologies, and circular economy initiatives, and may provide full or partial support for tuition, living expenses, and research activities during the program. It is estimated that 5-10% of the students can secure such scholarships and awards valued at about \$6,000 to \$10,000 per opportunity.
- Sessional Lectureship Opportunities: Senior PhD students (3rd and 4th year) within the proposed program may have opportunities to serve as sessional lecturers or instructors for undergraduate courses within GCM, subject to qualifications, departmental needs, and collective agreement provisions. These opportunities provide valuable teaching and academic leadership experience while supporting professional development for doctoral students. Compensation for a standard undergraduate course assignment is typically

estimated at approximately \$10,000 per course per term for a three-hour-per-week course.

**Table 3.1: Breakdown of financial support and student funding.**

| <b>Funding Source</b>                                           | <b>Master's Student<br/>(Average Annual Support)</b>                         | <b>PhD Student<br/>(Average Annual Support)</b>                              | <b>Notes</b>                                                                                                                                           |
|-----------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stipend                                                         | ~\$12,000                                                                    | ~\$15,000                                                                    | Linked to funded faculty research projects in sustainable materials, packaging systems, consumer behaviour, packaging technologies, and related areas. |
| Academic Assistantships (AA)                                    | ~\$10,000                                                                    | ~\$10,000                                                                    | Estimated ~200 hours annually per student across undergraduate and graduate course support opportunities.                                              |
| External Scholarships & Awards                                  | ~\$15,000 (for ~10–15% of students)                                          | ~\$15,000 (for ~25–30% of students)                                          | Includes OGS, Canada Graduate Research Scholarships, Tri-Agency awards, and other competitive funding opportunities.                                   |
| Internal Scholarships & Awards                                  | ~\$15,000 (for ~10–15% of students) + potential domestic funding allocations | ~\$15,000 (for ~10–15% of students) + potential domestic funding allocations | Domestic allocation estimates: ~\$3,400/year per master's student (up to 2 years) and ~\$7,000/year per PhD student (up to 4 years).                   |
| Industry-Supported Research Opportunities (e.g., Mitacs, TiCAN) | ~\$20,000 (for ~20–30% of students)                                          | ~\$20,000 (for ~20–30% of students)                                          | Includes internships, applied research collaborations, and industry-sponsored projects.                                                                |
| Industry-Supported Research Assistantship Opportunities         | ~\$2,000–\$4,000                                                             | ~\$2,000–\$4,000                                                             | Additional industry-sponsored research support and applied project funding.                                                                            |

|                                           |                                                          |                                                          |                                                                                                             |
|-------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| International Scholarships & Sponsorships | ~\$6,000–\$10,000 (for ~5–10% of international students) | ~\$6,000–\$10,000 (for ~5–10% of international students) | Includes government sponsorships, exchange programs, and employer-supported graduate education initiatives. |
| Sessional Lectureship Opportunities       | Typically not applicable                                 | ~\$10,000 per course/term (senior PhD students)          | Available primarily to senior PhD students (Years 3–4), subject to qualifications and departmental needs.   |

## Adequacy of Financial Support

These combined funding sources are expected to provide sufficient financial support (for PhDs: Tuition + \$20,000; for MScs: Tuition + \$13,400) to attract and retain high-quality students at both the MSc and PhD levels. The availability of research funding, assistantships, and external awards will enable students to focus on their research activities and successfully complete their degrees in a timely manner.

**Table 3.2: Estimated typical annual funding profile.**

| <b>Student Type</b> | <b>Typical Core Funding (Stipend + AA + domestic allocation)</b> | <b>Potential Enhanced Funding Opportunities</b>                                                                                                        |
|---------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master's Student    | ~\$25,400/year                                                   | Scholarships, Mitacs/TiCAN opportunities, industry-sponsored projects, and international sponsorships may increase total annual support significantly. |
| PhD Student         | ~\$32,000/year                                                   | Scholarships, sessional teaching opportunities, Mitacs/TiCAN projects, and industry partnerships may substantially increase annual funding support.    |

The program's strong industry connections and research capacity further enhance opportunities for funded research and experiential learning, contributing to a competitive and supportive graduate student environment.

## 3.2 Faculty

The programs will be delivered by core faculty members in the School of Graphic Communications Management (GCM) together with associated faculty from other departments who bring complementary expertise in packaging science, print technology, consumer behaviour, materials science, design, and management. Several participating faculty are current

members of the Yeates School of Graduate and Postdoctoral Studies (YSGPS) and maintain active research programs relevant to sustainable packaging systems.

Faculty members who are expected to contribute to teaching and supervision include, but are not limited to: Prof. Jay Park (GCM), Prof. Ehsan Behzadfar (GCM), Prof. Natalia Lumby (GCM), Prof. Reem El Asaleh (GCM), Prof. Layal Shuman (GCM), Prof. Martin Habekost (GCM), Prof. Krzysztof Krystoski (GCM), Prof. Solmaz Karamikamkar (GCM), Prof. Nariman Yousefi (Chemical Engineering), Prof. Hadis Zarrin (Chemical Engineering), Prof. ChungHyek Lee (Chemical Engineering), and Prof. Jenna Jackson (Ted Rogers School of Management). Collectively, these faculty members bring expertise in packaging materials, printing and packaging technologies, sustainability, consumer behaviour, and supply chain systems, ensuring strong supervisory capacity and an interdisciplinary research environment for graduate students.

There will be approximately 6-7 new graduate courses offered annually, in addition to existing graduate courses available through GCM and collaborating departments that may support the proposed programs. Two new tenure-track faculty (TFA) members will be required to support the successful delivery, long-term sustainability, and growth of the proposed MSc and PhD programs while complementing the supervisory and teaching expertise already existing within the School of Graphic Communications Management (GCM) and collaborating departments. The additional faculty capacity will also support administrative responsibilities associated with graduate program delivery, including course release requirements for the Graduate Program Director. Beyond graduate teaching and supervision, the proposed faculty hires will strengthen research capacity in emerging and strategically important areas such as artificial intelligence in packaging systems, smart and connected packaging, sustainable materials, advanced manufacturing, digital prototyping, and data-driven packaging innovation, aligning with evolving industry needs and supporting the strategic growth of research and graduate education within GCM. The proposed course offering structure is designed to provide sufficient elective flexibility while maintaining sustainable teaching capacity and ensuring that students are able to complete degree requirements in a timely manner. The curriculum includes two core courses - Research Methods in Packaging Science and Advanced Packaging Materials - along with approximately 4-5 elective course offerings annually selected from Group I and Group II courses. Additional elective flexibility will be supported through approved graduate courses offered by collaborating departments and related programs. Graduate teaching and supervision will be supported through existing faculty expertise, the addition of the proposed TFA hires, and carefully balanced teaching assignments intended to maintain the quality and continuity of undergraduate programming, with limited use of sessional instructors utilized where appropriate to provide additional instructional flexibility within the undergraduate program.

The programs will primarily be delivered by tenured and tenure-track faculty members, ensuring strong research supervision and program stability. It is anticipated that approximately 80–90% of courses will be delivered by tenured and tenure-track faculty, with 10–20% delivered by associate faculty, limited-term appointments, or sessional instructors when appropriate. This balance will support program sustainability while maintaining a high-quality academic and research environment for graduate students.

### 3.3 The Academic Unit

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science will be delivered within the School of Graphic Communications Management (GCM) in The Creative School at Toronto Metropolitan University. The academic unit has the capacity to support the programs by effectively utilizing existing human, physical, and financial resources.

#### Utilization of Resources

The programs will be supported by an established group of faculty members within GCM who are actively engaged in research and graduate supervision through the Yeates School of Graduate and Postdoctoral Studies (YSGPS). Additional interdisciplinary support will be available through collaboration with faculty in related departments across the university.

Administrative support will include a 0.5 FTE Graduate Program Administrator (GPA), supplemented by existing technical staff and institutional support services. This level of administrative and technical support is sufficient to manage admissions, student progression, and program operations at the anticipated enrollment levels.

The programs will also benefit from established institutional support services, including those provided through the Yeates School of Graduate and Postdoctoral Studies (YSGPS), such as graduate admissions, academic policies, student support services, and professional development programming.

The programs will make use of existing infrastructure, including:

- GCM laboratories and teaching spaces
- Faculty research laboratories
- Facilities associated with the Centre for Packaging Innovation and Sustainability (CPIS)
- Additional resources within The Creative School, such as The Catalyst space, which is available for use by all Creative School graduate students

These facilities provide an appropriate environment for graduate-level coursework, laboratory activities, and advanced research at both the MSc and PhD levels.

#### Impact on Other Programs and Institutional Commitments

The proposed programs are expected to have minimal impact on other existing programs at the university. While some overlap in subject matter may occur with programs in environmental studies, management, and communication, the Packaging Science programs are distinct in their integrated and specialized focus.

Any incremental teaching demands within GCM will be managed through strategic course scheduling and distribution of graduate teaching and supervision responsibilities among participating faculty members, with limited use of contract instructors (e.g., CUPE), while

seeking budget approval for an additional tenure-track faculty position aligned with packaging science and sustainability. This will ensure to maintain flexibility and balance across undergraduate and graduate offerings. In addition, students within the proposed programs will have opportunities to contribute as Academic Assistants within GCM undergraduate courses, consistent with existing practices involving senior undergraduate and graduate students from other programs. This approach is intended to support the integration and growth of the proposed graduate programs while maintaining the quality and continuity of undergraduate program delivery.

The programs will rely on existing institutional commitments and services, including:

- Graduate admissions and academic administration through YSGPS
- Registrarial services
- Library and research support services
- Research administration and grant support
- Academic Assistantship available for GCM undergraduate courses

These services are already established and have sufficient capacity to accommodate the anticipated growth in graduate enrollment.

Overall, the School of Graphic Communications Management has the academic, administrative, and physical resources necessary to support the successful implementation and long-term sustainability of the MSc and PhD in Packaging Science, without negatively impacting other programs or institutional operations.

### 3.4 Additional institutional resource commitments

The proposed Master of Science (MSc) and Doctor of Philosophy (PhD) in Packaging Science will be supported by an established faculty base within the School of Graphic Communications Management (GCM) and existing institutional resources at Toronto Metropolitan University.

No new physical infrastructure is required to launch the programs. Teaching and research activities will be supported through existing facilities.

In addition, the interdisciplinary nature of packaging science will be supported through collaboration with faculty and facilities in related departments across the university, enabling access to complementary expertise in areas such as materials science, environmental studies, design, and business.

As the programs grow, additional resource needs will be monitored and addressed as required. This may include:

- Additional faculty hiring or cross-appointments to support increased supervision and teaching demands
- Expanded teaching support or graduate assistantships

- Incremental enhancements to laboratory and research infrastructure

Overall, the proposed programs can be effectively implemented using existing institutional resources, with a scalable approach to future resource commitments aligned with enrollment growth and research activity.

### 3.5 UPO Consultation

The University Planning Office (UPO) has reviewed the proposal. Preliminary analysis indicates that the MSc and PhD programs combined would require the addition of two new TFA faculty members, and a graduate program administrator and a graduate program director shared between the two programs. Financial details will be finalized as the proposal evolves.

# Appendices

[Combined Appendices PDF](#)