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| **C**ollaborative **Re**search **a**nd **T**raining **E**xperience in **S**ustainable **E**lectronics and **E**co-**D**esign (CREATE SEED) | Logo  Description automatically generated |

# **Context**

Consumer electronics offer the potential to improve quality of life and broaden education and information access. Unfortunately, the rapidly growing demand of consumer electronics has led to unsustainable amounts of waste electrical & electronic equipment (WEEE). In 2016, global WEEE was 44.7 megatons with Canada contribution being 724 kilotons of WEEE. WEEE contains hazardous substances that pose health and environmental concerns. On the other hand, the presence of valuable metals in the WEEE stream constitutes economic opportunities for the recycling industry. There is 100 times more gold in a ton of mobile phones than in a ton of gold ore. The material value alone is worth $62.5 billion.

To promote sustainability in the electronics industry, a paradigm shift needs to occur in its economic practices from linear to circular. To implement such a shift, **CREATE SEED** trainees will work on ambitious research objectives. They will tackle the urgent WEEE issues through the optimization of recovery and recycling of components from existing WEEE. Trainees will re-envision electronics design by bringing together the best of conventional inorganic electronics and emerging organic technologies and developing manufacturing processes that minimize the environmental footprint. **CREATE SEED** will facilitate the integration / transition of transformative experts with engrained sustainability principles applicable to electronics and emerging technologies, at large, to the Canadian workforce.

# **Training objectives**

**CREATE SEED** has the ambitious *long-term objective* to train a new generation of experts with a *circular vision in electronics*, *where device beginning- and end-of-life are as important as device performance*. Designers, manufacturers, investors, traders, miners, raw material producers, consumers, policy-makers have a crucial role to play in reducing waste and retaining value within the system, thus improving environmental/human health performance of consumer electronics. To achieve this long-term objective, the following specific training objectives were identified:

1. **Shifting paradigms from linear to circular design thinking with evidence-based approaches and critical thinking** for the sake of environment and human health;
2. **Breaking silos and eliminating blind spots** in the electronics supply chain detrimental to the improvement of the environmental footprint of electronics;
3. **Promoting awareness about the global (transboundary) dimension of the WEEE issue.**

# **Student commitments**

|  |  |  |  |
| --- | --- | --- | --- |
| **Program content** | **Curriculum element** | **Mandatory** | **Credits** |
| Training initiatives | Set of graduate courses by the flipped (inverted) classroom model | Y | 6 |
| New course in Sustainable Electronics (eligible within the 6 credits) | N |  |
| One Summer School (4 days) | Y |  |
| Two Workshops (web-based, ½ day) | Y |  |
| Trainee mobility | Internships in industry, governmental and non-governmental  organizations (in Canada and abroad) | N[[1]](#footnote-2) |  |
| Interinstitutional mobility of trainees during Summer Schools | Y |  |
| Professional skills | One workshop/year will be devoted to ‘Survival Skills’ and other on communication (including public speaking and media training). Professional skills to be developed during team work to solve cases at Summer Schools | Y |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Last Name** |  | | **Applying for a scholarship of:** |
| **First Name** |  | | ◻ BSc ◻ MSc ◻ PhD |
| **University** |  | | **Supervisors** (Institution/Department) |
| **Student #** |  | | 1- |
| **Previous Study** (diploma, place and date of completion) | | |
|  | | | 2- |
| **SEED Enrolment Date** | | | 3- |
|  | | |
|  | |  | |
| **Educational background of the student.** Please list all courses taken in the past that fulfill the academic expectations of CREATE SEED, whether they are equivalent or closely related. These courses must be in pure sciences, engineering and social sciences. Examples of appropriate engineering-courses would be in Microfabrication, Optoelectronic Devices, Life Cycle Assessment, Urban Mining and Nanotechnology and the Aquatic Environment. Examples of pure sciences-courses would be in Physical Chemistry, Spectroscopy, Solid-State Physics, Electrochemistry, Microbiology, Toxicology. One example of appropriate course in social sciences will be in Critical Media Infrastructures whereas one in Economy could be Circular Economy. | | | |
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|  | **Academic Plan** | | **SEED Course Code** (See Annex) | **Academic**  **Session** | **Grade** |
| **Core Training**  6 credits | 1- |  |  |  |
| 2- |  |  |  |
| 3- |  |  |  |
| 4- |  |  |  |

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| --- | --- | --- |
|  |  | **Workshops (two technical and one soft skills)/Summer school** (at least one summer school and two workshops) |
| **Year 1** |  |
| **Year 2** |  |
| **Year 3** |  |
|  | **Mobility (exterior university research/internship experience)** Specify the duration (in months)  and location. | |
| **Year 1** |  | |
| **Year 2** |  | |
| **Year 3** |  | |

# **Note**

The CREATE SEED Student Selection Committee will evaluate the candidates based on this form information and:

* CV
* Motivation letter
* Reference letters (Three reference letters of which one may be from the future supervisor)

ANNEX

**CREATE SEED Courses**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | **Code** | **Institution** | **Responsible professor** | **Semester** |
| Life cycle analysis | DDI8003E | Polytechnique | Margni, M. | F/W |
| Circular Economics | ND8111E | Polytechnique | Sophie Bernard | F |
| Urban mining and e-waste recycling | TBD | UBC | Maria Holuszko | W |
| Biomass Conversion | GCH8103 | Polytechnique | Jamal Chaouki | W |
| Sustainable Electronics | TBD | TBD | TBD | TBD |
| Catalysis and Applied Kinetics | GCH6201 | Polytechnique | Daria Boffito |  |
| Microfabrication – Green Chemistry | TBD | TBD | TBD | W |
| Fundamentals of Spectroscopy: Materials Characterization | CHEM 603 | McGill | Ian S. Butler  Matthew J. Harrington  Audrey H. Moores | F |
| Materials Characterization | MTR6404E | Polytechnique | Rochefort, Alain | W |
| Microfabrication | PHS8310 | Polytechnique | Yves-Alain Peter  Marie-Hélène Bernier  Andy Shih | F |

TBD: To be determined

1. Diverse set of internships available. As a function of their career plans, trainees will decide if taking advantage of this opportunity. [↑](#footnote-ref-2)