



# **WEEF PROPOSALS SUMMARY**

**S2018**

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# Chemical Dept (CHE)

S18-1304



## AFM for Nano Engineering Undergraduate Laboratory

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### Description of Proposal

This proposal is for purchasing two Atomic Force Microscopes (AFM) for viewing nano-materials, following the reactions and purification processes, and many other potential applications for Nanotechnology Engineering Undergraduate Laboratory. AFM has developed into one of the most successful tools for applications such as product development and quality control.

### Proposal Benefits

AFM is introduced to the Nano Engineering students in their second year (2A). All the students in the program use this technique for quality control of their products. They will have hands-on experience with AFM which will give them confidence to be able to operate it again possibly during their co-op or graduate studies later on. AFM will also be used NE 455C lab to characterize the product and evaluate their design. We have a couple of old AFMs in the lab, which are not dependent and might stop working any time.

The benefits of the proposal are:

Having newer units will speed up the lab and will save students time to spend on other tasks in the lab.

The units that we have are old, they might stop working, and having a new AFM will help us being able to run the labs with no interruption.

They will help to improve the quality of the samples by helping in characterization.

They will enable the students to speed up preparing or characterizing samples.

All the undergraduate students in the nano program in 2A, and some in 4A will use AFM. (120 per year)

They will be used in the capstone design projects.

### Estimated Equipment Lifetime

10Y

### Implementation Schedule

Fall 2018

### Additional Information

NE program will match WEEF funds.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Atomic Fprce Microscope	\$ 20000	\$ 10000	\$ 0	\$ 0
<b>Total</b>	<b>\$ 20,000</b>	<b>\$ 10,000</b>	<b>\$ 0</b>	<b>\$ 0</b>



## Potentiostat for Electrical Impedance Spectroscopy

Neil McManus

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### Description of Proposal

A potentiostat is a device that can control electrical parameters such as voltage or current while measuring electrical responses from electrochemical reactions. Electrochemical testing using potentiostats is important for many engineering applications and currently a large amount of research in nanotechnology is utilizing such testing. For example, such testing is relevant for battery and supercapacitor technology. In the NE teaching laboratories, we currently have potentiostat units that measure/control basic current / voltage responses in electrochemical testing. A deficiency of the current units is that they cannot electrical impedance spectroscopy measurements.

Newly developed labs in NE would be enhanced by the capability to do such measurements.

### Proposal Benefits

Impedance measurements are useful for assessing series resistance in supercapacitors (SC), which are the subject of a new NE 4th year exercise. laboratory exercise. Presently voltage drop measurements are used to estimate resistance in the student made SC and such measurements can be a bit subjective. The use of EIS gives less ambiguous measure of electrical resistance in a supercapacitor and the method is recommended by literature protocols. So the use of such instruments provide students the opportunity to carry out testing that is relevant to state of the art testing in Energy Storage

### Estimated Equipment Lifetime

> 10 years

### Implementation Schedule

Testing F 2018, first student lab W 2019.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Potentiostat	\$ 20655	\$ 10328	\$ 5164	\$ 0
<b>Total</b>	<b>\$ 20,655</b>	<b>\$ 10,328</b>	<b>\$ 5,164</b>	<b>\$ 0</b>

# Civil and Environmental Dept (CEE)

S18-1290

## Soils Mixer

Anne Allen

Laboratory Technologist, Civil and Environmental Dept (CEE)

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### Description of Proposal

To purchase a soils mixer for sample preparation for course curriculum teaching labs.

### Proposal Benefits

To ensure proper mixing of test samples for students labs. When the soil is properly and thoroughly mixed the students results will be more advantageous, and the comprehension of their results more favourable.

### Estimated Equipment Lifetime

With proper care and maintenance, immeasurable.

### Implementation Schedule

Fall term - 2018.

### Additional Information

Option #2 the CEE dept will pay for 25% of the total cost.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Soils Mixer	\$ 1905	\$ 1430	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,905</b>	<b>\$ 1,430</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Civil and Environmental Dept (CEE)

S18-1291



## Laboratory Balance

Anne Allen

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### Description of Proposal

To purchase an additional balance of high capacity for teaching lab purposes. Students are required to use balance/scale(s) to gather data to complete course curriculum labs.

### Proposal Benefits

The additional balance with a higher weighing capacity would elevate concerns and/or issues when students are working with larger test samples. It will also improve “wait times”, and lab symmetry. This balance could also be utilized by other CEE courses/labs beside the geotechnical labs.

### Estimated Equipment Lifetime

With proper care and maintenance, along with yearly calibrations the estimated lifetime is endless.

### Implementation Schedule

Fall term, 2018.

### Additional Information

Option #2 is the CEE dept. contributing 25% of the total cost.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
High Capacity Balance	\$ 3150	\$ 2363	\$ 0	\$ 0
<b>Total</b>	<b>\$ 3,150</b>	<b>\$ 2,363</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Civil and Environmental Dept (CEE)

S18-1331

## YSI Rhodamine Probe

Mark Merlau

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### Description of Proposal

Rhodamine dye tracing is used for several applications including time of travel studies in streams and discharge measurements. The dye mimics the movement of water molecules and can thus be used to simulate dispersion and mixing. The YSI rhodamine probe fits onto a device called a Sonde, which is used to monitor various water quality parameters. During a dye tracer study, the rhodamine probe is placed downstream from the dye injection point and measures the dye concentration (fluorescence) as it passes by.

This proposal is for one rhodamine probe.

### Proposal Benefits

The proposal will benefit approximately 85 students per year and will enable continued dye tracing studies within the ENVE 330 course. The rhodamine probe will also be available for Capstone Design projects if needed.

### Estimated Equipment Lifetime

Approximately 10 years, with one-year warranty.

### Implementation Schedule

Immediately upon receipt.

### Additional Information

The CEE department will contribute partial funding up to 33%. The YSI rhodamine probe was part of a successful WEEF purchase in the past (2010). Although that probe still works, it is nearing the end of its life and will soon need to be replaced. The CEE department does not have a backup for this piece of equipment.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
YSI Rhodamine Probe	\$ 5364	\$ 3578	\$ 0	\$ 0
<b>Total</b>	<b>\$ 5,364</b>	<b>\$ 3,578</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Mechanical and Mechatronics Engineering (MME)



S18-1325

## Development of New Ankle Foot Orthoses

*Christian Mele*

*Lab Team Co-Leader, Mechanical and Mechatronics Engineering (MME)*

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### Description of Proposal

This proposal is for the new and upcoming lab group ALO (Advanced Lower-Limb Orthotics). The proposal is for new materials for the creation of new Ankle Foot Orthoses that will be tested and implemented into new designs. These new novel designs for Ankle Foot Orthotics cannot be made or tested without the funding for physical material prints. These prints are being tested in lab on lab members and with groups like kidsability and Orthopedic Bracing Solutions.

### Proposal Benefits

The proposal benefits both the advancement of the team in their research field of Ankle Foot Orthotics, but also would allow for the continuing growth of the team and the addition of new members as if there are more orthotics to test on then there is more designs to iterate upon and improve and more data that can be collected. With more data and designs the group can and will need to grow due to the increasing volume of information.

### Estimated Equipment Lifetime

The equipment is the prints gained from utilizing the new on campus printing centre that graduate students and professors have access to. The lifetime of the prints is dependent on whether the group will add upon or create new designs after testing the current designs. Lifetime could be upwards of a month for a design to multiple months as the new design is iterated upon.

### Implementation Schedule

The plan is to immediately start 3D printing immediately and testing utilizing the funds that WEEF provides. With the requested amount, the expected number of prints is 3, allowing for a quick number of prints to be created, and then a quick expansion of the group as more support is needed to analyze the data, and to improve.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
3D Printing Costs for Ankle Foot Orthoses	\$ 500	\$ 375	\$ 250	\$ 0
<b>Total</b>	<b>\$ 500</b>	<b>\$ 375</b>	<b>\$ 250</b>	<b>\$ 0</b>

# School of Architecture (ARCH)

S18-1347



## Proposal 1: 3d Printers at UWSA

Maria Smirnova

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### Description of Proposal

This proposal is for an additional two new Maker Gear printers.

<https://www.makergear.com/products/m2>

\$1,550.00 - \$ 2550 CAD

### Proposal Benefits

3D printers a commonly used resource at the School of Architecture for both courses and student research. The Digital Fabrication courses at the UWSA involve fabrication tools already accessible at the school which are directly integrated into its curriculum. The 3D printers are a common device for the design explorations and fabrication related to this course, as well as the studio courses taken every semester. These printers are accessible to the entire study body and are used heavily in upper year Studio design courses which are heavy in computational design and fabrication (ex. ARCH392). During the 5 year program there are at minimum 10 courses in which digital fabrication is heavily used, and the student body is around 320 people.

The recently updated curriculum and the growing interest in using these tools mean during certain periods, the 3D printers we currently have are in incredibly high-demand by many undergraduate and graduate students, where upwards of 70 or 100 students may need access to these tools to meet the requirements of their course, in a period of 2 weeks.

Currently, there are 3 functional printers, accessible at all times to the student body. To reduce the backlog and demand on this limited resource, and the enable the fair use in coursework we would like to request funding for more machines which are integral to our program.

### Estimated Equipment Lifetime

5 years of continued use with proper maintenance.

### Implementation Schedule

The dedicated space is already available for these printers. If approved, they can be purchased and installed immediately.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Printer options	\$ 1550	\$ 1825	\$ 2550	\$ 0
<b>Total</b>	<b>\$ 1,550</b>	<b>\$ 1,825</b>	<b>\$ 2,550</b>	<b>\$ 0</b>

# School of Architecture (ARCH)

S18-1348



## Proposal 2: Oculus Rift for UWSA

Maria Smirnova

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### Description of Proposal

<https://tinyurl.com/y8kcc4de>

This proposal is for the purchase of an oculus rift and controllers along with mountable sensors.

\$699CAD + tax

### Proposal Benefits

Recently, many architectural firms have been adopting the use of virtual reality headsets both as a design and a representation tool. The ability to walk around and explore a digitally modelled environment is an invaluable design tool. At the school there is some use of these devices amongst graduate students investigating themes of representation and spatial perception in architecture.

The making of physical models is an expectation for many courses in the core curriculum, (design studio) both as study models and as final representations of projects. Their use is justified as being more tactile and effective than viewing digital models on a screen. The use of VR however, bridges this gap between the experience of a digital model and a physical tool. Having a permanent VR headset rigged up, into which any student at the school of architecture can come and intuitively model a design would be a useful tool, saving students' valuable time and expensive materials in the making of physical models.

### Estimated Equipment Lifetime

5+ years.

### Implementation Schedule

The space to set up, and control access to this tool is already available in the school, If approved they can be purchased and installed immediately.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Oculus Rift VR	\$ 699	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 699</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# School of Architecture (ARCH)

S18-1349



## Proposal 3: 3D Printers and VR for UWSA

Maria Smirnova

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### Description of Proposal

This proposal is to request that both options 1 and 2 submitted by be both considered for installed at the architecture campus.

\$2249-\$3249CAD

VR Set - <https://tinyurl.com/y8kcc4de>

Printer - <https://www.makergear.com/products/m2>

### Proposal Benefits

The values of each resource which is strongly needed at the school.

The 3D printers are a common device for the design explorations and fabrication related to this course, as well as the studio courses taken every semester. And having a permanent VR headset rigged up, into which any student at the school of architecture can come and intuitively model a design would be a useful tool, saving students' valuable time and expensive materials in the making of physical models would be invaluable.

These tools help with practice for skills required at architecture firms while on co-op, as well as the development done for projects during design and fabrication courses. As the functions of these devices do not cancel each out, having both resources would be remarkably helpful to the entire student body.

### Estimated Equipment Lifetime

5+ years for printers and the VR Oculus set

### Implementation Schedule

The space to set up, and control access to this tool is already available in the school. If approved, they can be purchased and installed immediately.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
3d Printers and Oculus Rift	\$ 2249	\$ 2524	\$ 3249	\$ 0
<b>Total</b>	<b>\$ 2,249</b>	<b>\$ 2,524</b>	<b>\$ 3,249</b>	<b>\$ 0</b>

# Nanotechnology Engineering Dept (NANO)

S18-1305

## MA-8005 Manipulators (DC Probes) for Nano Undergra



John Saad

Laboratory Instructor, Nanotechnology Engineering Dept (NANO)

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### Description of Proposal

This proposal is for purchasing MA-8005 Manipulators (DC Probes) for Nano undergraduate laboratories.

### Proposal Benefits

We are planning to purchase new MA-8005 Manipulators that will upgrade the lab from very old worn out probes to new professorial look and very precisely controlled manipulator. It will allow students to measure the sheet resistance for different semiconductor devices. Currently, all NE students are borrowing 5 of these setups from the ECE labs, and as the NE program already doubled the throughput of the circuit's laboratory since spring 2016, there is a need to purchase another 20 new sets. Those setups will be used to expand our equipment to fit in devices testing lab for NE 242 course (Electronic devices).

The expected benefits of the proposal are:

1. To provide new units needed for doubling our labs.
2. To provide spare units to enable quick replacement of faulty units during the lab thus reducing inconvenience to the student group at the problem station.
3. These manipulators will be used in engineering undergraduate course : NE 242 (Electronic devices)
4. It will serve about 120 undergrad students.
5. Could be used for capstone design projects

### Estimated Equipment Lifetime

10+ years

### Implementation Schedule

Fall 2018

### Additional Information

It is our expectation that NE will match WEEF Funding.

Option#1 for 20 units while option#2 for 10 units

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
MA-8005 Manipulator from Gap Wireless	\$ 30000	\$ 15000	\$ 0	\$ 0
<b>Total</b>	<b>\$ 30,000</b>	<b>\$ 15,000</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering Student Machine Shop

S18-1313



## Tools and Equipment for Engineering 7 Project Shop

*Peter Teertstra*

*Director, Sedra Student Design Centre, Engineering Student Machine Shop*

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### Description of Proposal

The first floor of Engineering 7 (E7) includes a manufacturing space for undergraduate students that will be operated as part of the Engineering Student Shops. The E7 Project Shop is intended to provide a location for basic milling machine and lathe training, additional working spaces for student projects during busy times, and support of activities that are run within the Engineering Ideas Clinic.

The E7 Project Shop is divided into two parts: a machine shop with 15 working spaces that contains conventional machine tools, including drill presses, a band saw, lathes and mills; and an assembly area with 30 working spaces that contains hand tools and small power tools.

The E7 Project Shop is positioned as a beginner's shop, with an emphasis on training students who have never used machine shop equipment before. Training sessions (typically one day, 7-hour duration) for the use of the milling machine or metal lathe would be offered to students, and successful completion of these courses may be a requirement before students could access the E5 Machine Shop.

A full time staff position is being established and a certified machinist instructor will be hired to the position in the Spring term of 2018. The E7 shop will officially open in the Fall term of 2018.

A need exists to purchase a full set of milling machines and metal lathes, as well as supporting equipment including a drill press, and tooling (bits for milling machine, drill press, etc.) The Dean of Engineering has committed \$70,000 towards the purchase of this equipment, while the total cost to purchase is approximately \$106,000. This request is being split over three WEEF proposals in the Winter, Spring and Fall, 2018 terms.

In Winter, 2018 a total of \$12,000 of WEEF funding was allocated for this project. The remaining funding, \$24,000, is now being requested. Some equipment has already been ordered but a number of items, including the drill press, carts, and tooling, has yet to be purchased.

### Proposal Benefits

With the opening of Engineering 7 and the updating of existing facilities in Engineering 5, manufacturing opportunities for Engineering students will increase significantly. Currently the E5 Machine Shop can accommodate 28 students at peak times. Having the E5 Wood Shop and the E7 Project shop available will more than double the number of working spaces, to a maximum capacity of 85. This will be of great benefit to all students during the busy times of each term, and especially during key times such as in February and March for Capstone Design projects.

The machining equipment in the E7 Project Shop, the milling machines and metal lathes, will be identical to those in the E5 Machine Shop. This will allow students who have been trained using the equipment in E7 to transition more quickly and easily to the E5 equipment.

The E7 Project Shop is intended primarily as a training location for students who have never used machine shop equipment before, and the types of machines, staffing resources and hours of operation are selected that best fit this need. For example, the E7 Project Shop would be open Tuesday to Friday, 1pm – 9pm, and Saturday 10am – 5pm, corresponding to the timing of peak student demand.

The E5 Machine Shop will become a fabrication space where students who are familiar with operating machining tools can work on their projects, and the level and nature of the supervision and the types of tools and equipment provided are reflective of this. In addition to existing conventional milling machines and lathes, students would also have access to a CNC milling machine, welding and sheet metal fabrication.



### Estimated Equipment Lifetime

30+ years

### Implementation Schedule

The goal is to purchase and install the equipment in the Spring 2018 term. The E7 Project Shop is scheduled to open at the start of the Fall 2018 term.

### Additional Information

Purchase costs (approximate, single written quotes attached)  
 Milling machine (Heinman Machinery Ltd., 2 @ \$10,607) \$21,214  
 Metal lathe (Heinman Machinery Ltd., 3 @ \$18,546) \$55,638  
 Drill press (Brennan Machinery Ltd., 2 @ \$4,259) \$8,518  
 Tooling (Sowa Tool and Machine Co. Ltd.) \$5,987  
 Tool carts (UW Machine Shop, 16 @ \$200) \$3,200  
 HST (13%) \$12,292  
 TOTAL \$106,849

Funded by a partnership between  
 Dean of Engineering \$70,000  
 WEEF (\$12,000 per term, W18, S18, F18) \$36,000  
 TOTAL \$106,000

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Purchase of all remaining equipment	\$ 24000	\$ 0	\$ 0	\$ 0
Split purchase between Spring and Fall terms	\$ 0	\$ 12000	\$ 0	\$ 0
<b>Total</b>	<b>\$ 24,000</b>	<b>\$ 12,000</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Systems Design (SYDE)

S18-1339



## Table Frames and Chairs for SYDE classrooms

Andrew Wentzell, Gwyn Foster

SYDE 1B WEEF Representatives, Systems Design (SYDE)

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### Description of Proposal

This proposal is for the purchase of taller manually adjustable table frames and accompanying chairs for E5-6008 and E5-6006, allowing the back row of each room to be converted to standing height desks. After polling the SYDE 1B class, a significant number of students(73%) would have liked taller tables in the back of the classroom, to improve sightlines and offer the ability to customize our learning environment. While it is possible to build platforms under the desks, SYDE classrooms are often rearranged during class activities, meaning it is difficult to build a platform under the desks that does not provide a tripping hazard and leaves the tables portable.

### Proposal Benefits

Student polling indicates that there is an issue with the quality of learning in the back of the classroom. In the back row, students often find themselves unable to see the board, particularly things near the bottom of the board, and find themselves missing content as a result. There are also known benefits to standing desks in the academic environment, as studies have demonstrated that movement can enhance and improve the ability of students to learn new concepts (Jensen, Eric. "Moving With The Brain In Mind". Nemours. N.p., 2000. Web. 15 Feb. 2016.) Students who also face challenges such as ADHD will benefit even more from standing desks, giving them an opportunity to decide how they learn best.

This updated change would reach SYDE students in all present cohorts, as well as BME students who use the rooms for classes, easily accessing 500 students a term. In addition these rooms are open all the time as a collaborative study space, further extending its reach to students as they work on design projects and class assignments.

The ability to purchase new table frames means that old table tops can be reused in the new classroom layout, reducing waste, and improving our learning environment.

### Estimated Equipment Lifetime

30+ years for table frames in total functionality usage.

Variant for chairs. Polyurethane chairs in the department are expected to last 30 years in the department, while cheaper chairs are less likely to last as long, ~10 years.

### Implementation Schedule

In time for start of Fall 2018 Semester

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Table Frames	\$ 2960	\$ 2960	\$ 0	\$ 0
	\$ 10140	\$ 5650	\$ 0	\$ 0
<b>Total</b>	<b>\$ 13,100</b>	<b>\$ 8,610</b>	<b>\$ 0</b>	<b>\$ 0</b>

# ENGINEERING

S18-1330

## E2 Foyer furnishings

Mary Robinson

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### Description of Proposal

The furnishings in the E2 foyer don't meet the needs of students in search of study space and are in dire need of updating, especially now that the Undergraduate Engineering Office is now located at E2 1772. This proposal aims to upgrade the space, make it more inviting to students, and leverage opportunities within the University community.

### Proposal Benefits

The improvement of student spaces is current a focus for the University, so we can leverage the funding of the big grey work tables (similar to those found on the 2nd floor of RCH or throughout DC) with this work. The Dean's Office has also offered to cover funding gaps and will help with sourcing the furniture so that everything matches nicely with the new Architectural Engineering space at CPH 1320.

### Estimated Equipment Lifetime

20+ years for the tables & chairs. The marker board should get 5 years easily, unless it gets horribly abused.

### Implementation Schedule

Co-ordinating the schedule with Plant Ops to do the wall repairs will take some time, but I would like as much of this to be in place for Sept as possible.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Comfy chairs	\$ 2500	\$ 0	\$ 0	\$ 0
Grey table	\$ 0	\$ 0	\$ 0	\$ 0
Wall repair, table install, white board	\$ 1500	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 4,000</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering IDEAs Clinic

S18-1298



## Hardware for Nano Engineering Days

Chris Rennick

Engineering Educational Developer, Ideas Clinic, Engineering IDEAs Clinic

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### Description of Proposal

One important key to students succeeding in the program is to feel a part of the discipline. To achieve this, students need to experience what it “feels like to be an engineer” early in their program. In fall 2017, 4 offerings of Engineering Days were implemented to give students an immersive, hands-on, problem-solving experience. MSCI ran their annual Case Days, Mechatronics ran Tron Days, SYDE ran Design Dayz, and Civil piloted our first second year activity with Civ Days. In Winter 2018, Mech Days was piloted with 8 stream students, the first ever 2A Env/Geo Days was piloted, and ECE Days was run for the second year. All efforts were very successful, with positive feedback from both students and faculty. Engineering Days are organized by the Ideas Clinic, but rely on individual programs to steer the content to match their discipline. This event will require the development of over 20 activities, some unique to one program, and some shared between programs. Development of Nano Engineering Days is ongoing, with a scheduled pilot for 1B students in winter 2019. The estimated cost for the development is \$10,000 in total. We were awarded \$2,800 in Winter 2018, we are asking for \$2,500 from WEEF this term. The Ideas Clinic will contribute the remaining funds necessary to complete development.

### Proposal Benefits

Student feedback which has been collected thus far is highly positive, with high demand for more hands-on activities. These events allow students to get an exposure to the breadth of Engineering as a whole; they see what the process is like to bring a concept to an executed solution on a very condensed timeline, but which carries a high impact.

For the Nano Engineering project, students will design, assemble, and test a Scanning Tunneling Microscope (STM). This project requires them to integrate the knowledge they are learning in their 1B term including electric circuits, programming, and calculus to design and construct a real-world working prototype of an STM.

### Estimated Equipment Lifetime

We expect a life of 3-5 years from the project hardware we are creating.

### Implementation Schedule

Nano Engineering Days is scheduled for the winter 2019 term. Final development of equipment will happen throughout the spring and fall 2018 semesters.

### Additional Information

The Engineering Ideas Clinic has previously supported all implementations of Engineering Design Days, both in the development, and roll-out phases. WEEF previously provided ~\$2,800 in Winter 2018 towards Nano Engineering Days.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Hardware for Nano Engineering Days	\$ 2500	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 2,500</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering IDEAs Clinic

S18-1299



## Equipment for Digital Ideas Clinic

*Chris Rennick*

*Engineering Educational Developer, Ideas Clinic, Engineering IDEAs Clinic*

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### Description of Proposal

The primary purpose of maker spaces is for rapid prototyping of mechanical systems. While these are very useful to provide students with a complete design experience centered around a physical object, they are missing electronic prototyping, construction, and testing equipment. Towards this end, we intend to add equipment to allow our students to work with the newest surface mount technology, PCB prototyping technology, re-work stations, and debugging equipment.

This proposal is seeking WEEF's support of what we are calling the "Digital Ideas Clinic", and will be housed on the second floor of Engineering 7. We are seeking \$20,000 from WEEF for a state of the art suite of electronic debugging and testing equipment. The Digital Ideas Clinic will provide students with exposure to Internet-of-Things devices, sensors and instrumentation, and machine learning.

### Proposal Benefits

The unique equipment in this facility will allow the Engineering Ideas Clinic to hold high-impact Engineering Days events for Electrical and Computer Engineering students, upper year Mechatronics Engineering students, and others. An estimated 1500 students per year will directly benefit from the activities which this equipment will allow.

### Estimated Equipment Lifetime

We expect a life of 10+ years from this equipment.

### Implementation Schedule

Engineering 7 is schedule to open in September. We would like to have this equipment available when the building opens.

### Additional Information

The Engineering Ideas Clinic has already invested nearly \$20,000 in a set of 10 oscilloscopes and power supplies. Moving forwards, the Ideas Clinic will purchase the prototyping equipment that this space will require (soldering irons, rework stations, etc). The Ideas Clinic expects to spend an additional \$20,000 in 2018 to further outfit this space.

Keysight provides a 25% discount on our purchases of their equipment, and so are our preferred vendor for this initiative.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
4 oscilloscopes with 2 analog/8 digital channels	\$ 12000	\$ 0	\$ 0	\$ 0
Spectrum analyzer	\$ 8000	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 20,000</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering Orientation (EngFOC)

S18-1297



## Turning O-week into O-strong

*Bryn Cummings*

*EngFOC member, Engineering Orientation (EngFOC)*

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### Description of Proposal

Engineering orientation plans and executes every aspect of the orientation week welcoming first year students with the help of student leaders. Orientation week is the first opportunity for first year students to see the campus as an undergraduate student and meet their faculty, department, other first and upper year students.

The below proposal is requesting items essential to make the week as amazing as possible including: First year t-shirts, first leader multi-tools, first year water bottles, pipe wrench keychains, and first year hard hats.

### Proposal Benefits

The contributions of the committee go directly to improving the experience of first year students during their first week at the University of Waterloo. They are exposed to many different clubs and resources the university has to offer, such as the Engineering Society.

Engineering Orientation is extremely costly and any additional funds the committee is willing to contribute will be put toward improving the experience of both engineering leaders and first year students.

### Estimated Equipment Lifetime

Unfortunately almost all items purchased for orientation is designed to be consumed during the week. This is for a few reasons. Firstly, most of the reusable items have been purchase by faculty or university FOC. Secondly, the focus is on giving first years the best experience which means spending the money on stuff for them and their experience. Finally, we have a tiny storage space. However, all the items we are asking for are items given to first years that they will have for a long time (the life of a shirt, keychain, multi-tool, water bottle and hardhats: approximately: 20 years)

### Implementation Schedule

All swag items will be ordered in early August, but budget will be completed in September after the week has ended. Other items will be purchased at the discretion of FOC or directors between July 1, 2018 - September 1, 2018.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
First Year t-shirt (1625)	\$ 8109	\$ 4000	\$ 2000	\$ 1000
Multi-tools (1525)	\$ 8952	\$ 4500	\$ 2500	\$ 1000
First Year Water Bottle (1525)	\$ 3447	\$ 2000	\$ 1000	\$ 500
Pipe-wrench Keychain (1650)	\$ 4994	\$ 2500	\$ 1500	\$ 1000
First Year Hardhats (1650)	\$ 10560	\$ 6000	\$ 5000	\$ 2500
<b>Total</b>	<b>\$ 36,062</b>	<b>\$ 19,000</b>	<b>\$ 12,000</b>	<b>\$ 6,000</b>

# 4th Year Design Project (FYDP)

S18-1309



## Alternative Bench Press FYDP

*Brandon Ming Sum Wong*

*Project Manager, 4th Year Design Project (FYDP)*

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### Description of Proposal

The Alternative Bench Press is a safer replacement for the current bench press by removing the need for weighted plates. It will be designed to be more convenient to use and cheaper, allowing for an equally effective workout whilst having less equipment. Although there are current replacements in the market for the bench press, these alternatives are not as popular due to the stricking motion they impose.

The main method of actuation for this design is utilizing a DC motor to pull on a cable, which is attached to the barbell. The DC motor provides tension on the cable, thus acting as the resistance needed for an effective exercise.

### Proposal Benefits

Our FYDP group plans to reach out to PAC and CIF to partner for this innovative new exercising method. A working prototype can be used to reduce the University of Waterloo's fitness centers costs for equipment and improve safety of students. Furthermore, this product can help increase the University of Waterloo's athletic reputation. This product will encourage students to exercise (even if they don't have friends to go with), as it will be safer and easier to use.

Large WEEF stickers will be placed on our product at the Mechanical and Mechatronics Symposium.

### Estimated Equipment Lifetime

5+ Years

### Implementation Schedule

The DC Motor is planned to be purchased by the end of this semester.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
DC Motor	\$ 300	\$ 200	\$ 100	\$ 0
<b>Total</b>	<b>\$ 300</b>	<b>\$ 200</b>	<b>\$ 100</b>	<b>\$ 0</b>



*Jamie En-Hui Su*

*Finance Director, TedXUW*

*jesu@uwaterloo.ca*

### **Description of Proposal**

TEDxUW, operated under a license from TED, is an annual event that brings together the world's leading thinkers and doers to share ideas worth spreading that impact any discipline — technology, entertainment, design, science, humanities, business, development. TEDxUW's main goal is to tackle humanity's most challenging questions and inspire individuals to transform their lives and ultimately the world, by introducing a broad spectrum of ideas in an innovative and unique approach. It has inspired hundreds of delegates including students and professors at Waterloo by providing participants with a platform to think critically and share their discoveries with others that share similar interests. Founded in 2011, this is our event's seventh consecutive year since establishment and the second year we will be able to accommodate 700 attendees with our upgraded TEDx license. The nature of the TEDxUW conference will allow us to reach hundreds of UW delegates that participate in the conference in October, and potentially millions of people around the world through our published TEDxUW talks online.

This year, the theme of TEDxUW is 'Making Waves.' We are shifting from the inspirational and broadening horizons side that the previous themes had, which were 'Defying Conventions' and 'The Interconnectedness of Things' in order to achieve our mission of fostering change and sharing thought-provoking ideas.

We are sincerely requesting the Waterloo Engineering Endowment Fund to help fund the items listed below in order to facilitate this year's TEDxUW conference:

1. Linens 54'' x 120'' (fits 6' and 8'): We require six linens in order to set up the sponsorship booths for students to visit and network with the representatives. This item will be rented.
2. Drapes (12' high): In order to neatly cover items at our reception area, we require three drapes. This item will be rented.
3. Lanyards/badge holders: We will require 850 lanyards/badge holders for delegates, including students, professors, university alumni, and community members, sponsors, as well as the TEDxUW ambassador team and the TEDxUW executive team. Lanyards will be used to hold name tags so that participants and attendees can be appropriately identified at the conference.

### **Proposal Benefits**

The TEDxUW 2018 executive team consists of 23 members, with 5 in Engineering. In particular, we have 3 members in Systems Design Engineering, 1 in Software Engineering, and 1 in Mechatronics Engineering. By providing funding to help run this conference, the Waterloo Engineering Endowment Fund will help Engineering students within the executive team apply graphic design, project management, UX/UI, and other concepts learned in lectures to organize and contribute to a huge project that will benefit a great number of Engineering students as an end result.

According to our 2017 attendee metrics, Engineering students accounted for the largest faculty representation of student delegates. This percentage illustrates the large number of Engineering students that have been influenced by our conference. 23.5% of our delegates comprised of Engineering students, 22.7% of Arts students, 17.8% were Science students, 15.7%



were Mathematics students, 12.4% were Applied Health Science students, and 7.9% were Environment students. The TEDxUW 2017 conference held around 700 delegates, so we anticipate a similar amount of candidates for 2018, with a majority of students in the Engineering faculty.

TEDxUW is an appealing conference that is a valuable opportunity for all Engineering students to apply for and attend, which will create a tremendous effect on the faculty as a whole and provide students with the opportunity to gain exposure to new fields. In our previous year, companies such as Nulogy, Microsoft, and Deloitte were sponsors of our conference. Students are allowed to network with sponsors and learn more about the company as a whole during our event. Furthermore, our 2017 conference featured Tanner Philp, who discussed blockchain and emphasized the differences between cryptocurrency and regular currency. As an employee at Kik Interactive, Tanner was able to work with the team to develop an ecosystem of digital services powered by the cryptocurrency, Kin. Another speaker named Bruce Taylor was a Chemical Engineering graduate of the University of Waterloo. He addressed ways to conserve energy and water, prevent pollution, and use a sustainable development and treatment process design to construct water purification systems using locally available materials. TEDxUW's diverse conference with an array of quality talks by guest speakers will enhance the educational experience of Engineering students and pique the interests of non-Engineering students by encouraging them to learn more about cryptocurrency, technology, software, and business data in the corporate world.

Overall, TEDxUW is an excellent opportunity for participants to not only tackle humanity's most challenging questions and transform their lives, but gain exposure to a variety of career disciplines such in technology, entertainment and design. Overall, this year's TEDxUW conference aims to provide Engineering students with the opportunity to dive beyond their interests and the chance to explore a variety of talks related to the field of engineering, which support TED's mission of analyzing "ideas worth spreading."

TEDxUW sincerely hopes to establish a partnership with the Waterloo Engineering Endowment Fund (WEEF), which will benefit Engineering students in a multitude of ways. Listed below are TEDxUW's sponsorship tier levels. The process of acknowledging WEEF's contribution is flexible and can be further discussed and customized.

Title Sponsor (\$10,000):

Brand Presence

- Premium branded props for photo booth
- Branded swag in gift bags

Logo Visibility

Featured on...

- Website and pamphlet\*\*
- Delegates bag\*\*
- All event signage\*\*
- Monthly newsletter to attendees
- Event screen during lunch and opening/closing ceremony

Awareness

- Premium event booth\*
- Company description featured in pamphlet\*\*
- 1 minute presentation during opening and closing ceremonies
- Featured on photo booth backdrop



#### Perks

- Complimentary Event Tickets\*\*\* (6)
- Featured in published TEDxUW talks\*\*
- Recruitment: receive resumes from delegates
- Industry exclusive

#### Key Partner (\$5,000):

##### Brand Presence

- Standard branded props for photo booth
- Branded swag in gift bags

##### Logo Visibility

###### Featured on...

- Website and pamphlet\*\*
- Delegates bag\*\*
- All event signage\*\*
- Monthly newsletter to attendees

##### Awareness

- Standard event booth\*
- Company description featured in pamphlet\*\*
- Honourable mention during opening and closing ceremonies

#### Perks

- Complimentary Event Tickets\*\*\* (5)
- Featured in published TEDxUW talks\*\*
- Recruitment: receive resumes from delegates

#### Collaborator (\$3,000):

##### Brand Presence

- Standard branded props for photo booth
- Branded swag in gift bags

##### Logo Visibility

###### Featured on...

- Website and pamphlet\*\*
- Delegates bag\*\*

##### Awareness

- Standard event booth\*

#### Perks

- Complimentary Event Tickets\*\*\* (4)

#### Community Supporter (\$1,000):

##### Logo Visibility



Featured on...

- Website and pamphlet\*\*

\*Can be used for product demonstration, giveaways and more

\*\*Sized according to partnership tier

\*\*\*The number of tickets allocated is the number of representatives that can attend from your organizations

### **Estimated Equipment Lifetime**

The linens and drapes will be returned to the rental company. Laptop stickers and lanyards/badge holders will be handed out to attendees of the conference; any extra items that are not given to delegates will be used for future conferences and giveaways.

### **Implementation Schedule**

The items required will be purchased during the Fall 2018 term, before our conference.

### **Additional Information**

Listed below are the costs of each individual item we are requesting:

1. Linens 54'' x 120'' (fits 6' and 8')

- Quantity: 6

- Price per item: \$8.00

- Total (before tax): \$48.00

- Total (after tax): \$54.25

2. Drapes (12' high)

- Quantity: 3

- Price per item: \$5.50

- Total (before tax): \$16.50

- Total (after tax): \$18.65

3. Lanyards/Badge holders

- Quantity: 850

- Price per item: \$1.96

- Total (before tax): \$1,670.00

- Total (after tax): \$1,887.10

### **Funding Options:**

- Option 1 - full funding (100%): full funding for 6 linens 54'' x 120'' (fits 6' and 8'), full funding for 3 drapes (12' high), and full funding for 850 lanyards/badge holders.

- Option 2 - partial funding (75%): full funding for 6 linens 54'' x 120'' (fits 6' and 8'), full funding for 3 drapes (12' high), and partial funding for ~630 lanyards/badge holders.

- Option 3 - partial funding (50%): full funding for 6 linens 54'' x 120'' (fits 6' and 8'), full funding for 3 drapes (12' high), and partial funding for ~409 lanyards/badge holders.



- Option 4 - partial funding (25%): full funding for 6 linens 54'' x 120'' (fits 6' and 8'), full funding for 3 drapes (12' high), and partial funding for ~188 lanyards/badge holders.

**Cost Breakdown**

Item	Option1	Option2	Option3	Option4
Linens 54'' x 120'' (fits 6' and 8')	\$ 54	\$ 54	\$ 54	\$ 54
Drapes (12' high)	\$ 19	\$ 19	\$ 19	\$ 19
Lanyards/Badge holders	\$ 1887	\$ 1397	\$ 907	\$ 417
<b>Total</b>	<b>\$ 1,960</b>	<b>\$ 1,470</b>	<b>\$ 980</b>	<b>\$ 490</b>

# Baja SAE

S18-1326



## UW Baja SAE Spring 2018 Funding Request

*Stan Lu*

*Team Leader, Baja SAE*

*stan.lu@uwaterloo.ca*

### **Description of Proposal**

The UW Baja SAE team is currently designing and will soon be building an entirely new vehicle by Winter 2019. We have already secured funding for several important components. This proposal will be focused on an entirely new data acquisition system, the vehicle's gearbox, and backups of crucial parts.

**Data acquisition system** - The planned data acquisition system is the focus of a Fourth Year Design Project and will be used to obtain the loads experienced by the vehicle, vehicle acceleration, drivetrain performance, and fuel consumption. This system will be used to benchmark the current vehicle, then to fine tune the new car. My hope is that this system could be used for the next 3-5 years to optimize the design of future vehicles.

**Gearbox fabrication** - The team intends to use the UW Machine Shop to CNC an extremely intricately designed and lightweight gearbox for the new vehicle. The team is very familiar with the UW Machine Shop and prefers to work with them rather than some external shop. This item is purely for manufacturing, we are looking elsewhere for material funding.

**Backup parts** - This includes halfshafts, sensors, tires, and rims. Many of these components get extremely worn or sometimes broken during testing. By funding these items we are able to spend more resources testing the vehicle so we are prepared for competition.

### **Proposal Benefits**

See above. All items will assist the team in building the new 2019 vehicle, allowing undergrads to develop hands-on and technical engineering experiences.

In terms of benefits to the Faculty of Engineering, funding UW Baja SAE allows the team to operate normally. This includes participation in on-campus open house events, political events in E5, Engineering outreach events, and providing projects for fourth-year design project groups.

### **Estimated Equipment Lifetime**

Data acquisition system - 3-5 years

Gearbox - 3 years (based off past and current gearbox life)

Backup parts - 1 year

### **Implementation Schedule**

Data acquisition system - to be built starting fall 2018

Gearbox fabrication - fall 2018 or early winter 2019

Backup parts - winter 2019



### Additional Information

Please mix and match any options, partial funding is appreciated.

UWaterloobaja@gmail.com or my personal email for any questions, I would be happy to clarify any questions or concerns.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Raspberry Pi, PCB, Wiring & Connectors	\$ 350	\$ 150	\$ 100	\$ 0
IMU Sensor, Magnetic Tachometer, GPS, Transducers	\$ 550	\$ 250	\$ 200	\$ 0
Digital Display, Frames, Mounts, Covers	\$ 250	\$ 150	\$ 100	\$ 0
Battery Pack	\$ 120	\$ 60	\$ 0	\$ 0
Gearbox Machining @ UW Machine Shop	\$ 1500	\$ 1100	\$ 800	\$ 0
Half Shafts	\$ 500	\$ 300	\$ 0	\$ 0
Rims and Tires	\$ 700	\$ 500	\$ 300	\$ 0
Dynamometer sensor replacements	\$ 100	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 4,070</b>	<b>\$ 2,510</b>	<b>\$ 1,500</b>	<b>\$ 0</b>

# Midnight Sun Solar Rayce Car Team

S18-1337



## Midnight Sun New Motors

*Clarke Vandenhoven*

*Sponsorship Lead, Midnight Sun Solar Rayce Car Team*

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### Description of Proposal

Midnight Sun is looking to acquire new motors for its 13th solar car, MSXIII. We are currently using 20 year old motors, and while they remain mostly functional, they present a limit on the maximum energy efficiency of the car and, as a result, a limit on the quality of the team's results at competition.

### Proposal Benefits

Midnight Sun is one of the largest and oldest student design teams at the University of Waterloo. We compete in annual competitions around the world and perform quite well. We are also a source of engineering knowledge and practice for over 100 engineering students. To be able to compete effectively at competition, which would look very good on the University of Waterloo, we need effective motors.

### Estimated Equipment Lifetime

The motors last essentially indefinitely if good care is taken of them, but in practice, we will likely use these motors for the next 10 years.

### Implementation Schedule

These motors will be instituted for any future iterations of Midnight Sun, so starting next year. This will also represent a certain portion of the money going towards the purchase of new motors, so the purchase will only be made once we have sufficient funds for the purchase.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Brushless DC Motors	\$ 2500	\$ 3000	\$ 3500	\$ 4000
<b>Total</b>	<b>\$ 2,500</b>	<b>\$ 3,000</b>	<b>\$ 3,500</b>	<b>\$ 4,000</b>

# Nanorobotics Group (UW\_NRG)

S18-1323



## UW Nanorobotics Team Funding Proposal

*Xinyi Hu*

*Business and Marketing Team Lead, Nanorobotics Group (UW\_NRG)*

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### Description of Proposal

As a fully undergraduate research team, The University of Waterloo Nanorobotics Group (UW\_NRG) works on a variety of cutting edge micro design fields. Through the conceptualization of advanced physics principles, UW\_NRG is able to manipulate matter at the nano level. UW\_NRG has proven their abilities by their outstanding performances at the International Conference on Robotics and Automation (ICRA). This conference, hosted by the IEEE, provides a platform with which to showcase our work. On the world stage, UW\_NRG has received 1st place honours in micro-assembly along with 2nd in mobility at ICRA 2016. UW\_NRG has competed again this year at the 2018 Mobile Microrobotics Challenge hosted in Brisbane, Australia, and achieved third place on autonomous motion challenge and second place for the microassembly challenge. This competition experience has given a lot of inspiration to the technical team members, and they need new equipment and materials to advance their innovations.

### Proposal Benefits

UW\_NRG serves to provide its members with hands on experience with nanotechnology and micro-fabrication techniques. The engineering disciplines of the members of UW\_NRG span across multiple faculties, including Nanotechnology, Electrical, Software and Biomedical. UW\_NRG is able to provide access to high quality labs, provide opportunities for undergraduate research and the experience of real life applications of engineering course materials. The technical teams challenge members to design, test, and develop unique nanorobots that can accomplish various tasks at the nanoscale. Students in the business and marketing team are able to develop additional skills beyond technical capability, such as communication and formal writing. All of these exciting and innovating opportunities ensure that every member of UW\_NRG can foster skills they can use throughout their undergraduate and professional career.

### Estimated Equipment Lifetime

3D printing: \$33.05

1 Stepper motor: \$25 + \$10.48 (shipping)

Liquid Nitrogen: \$20

1 Threaded rod: \$1.97

2 Aluminum rod: \$9.52

CSYL-28 YBCO Levitation Disk: \$500

- cheaper alternative: CSYL-14 YBCO Levitation Disk: \$190

TOTAL:

\$600.02 (or \$290.02 for the cheaper alternative levitation disk)

All prices listed includes taxes and shipping fees. Levitation disk prices are converted from USD to CAD based on the exchange rate on the day this proposal is submitted. The typical lifetime for a stepper motor is 10,000 operating hours, which is approximately over 5 years. The rods are used for Z actuation, which will last for two years. The levitation disk lasts about 5 years.

### Implementation Schedule

The competition at Australia this year gave the technical team members a lot of inspiration in robotics design and



application. Therefore, these equipment and supplies will provide the robotics team ample resources to advance their innovations. The implementation of these essential supplies will begin immediately and will last for several years. Thus, all materials will be purchased within a month of receiving funding. As well, additional parts for other robots will be used over the next year to conceptualize innovative ideas. These ideas could bring about newer, and finer ways to control movement in the nano-scale and thus hold a heavy importance not only to future competitions but also to industrial applications.

### Additional Information

The support of WEEF, the University of Waterloo's Faculty of Engineering, the Dean of Engineering, and all of our various sponsors are greatly appreciated and crucial towards the success of UW\_NRG. For more information on UW\_NRG and our sponsors, feel free to visit our official website at: [www.uwnrg.org](http://www.uwnrg.org)

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Liquid Nitrogen	\$ 20	\$ 0	\$ 0	\$ 0
Levitation Disk	\$ 500	\$ 190	\$ 0	\$ 0
2 Aluminum Rods	\$ 10	\$ 10	\$ 0	\$ 0
3D Printing	\$ 34	\$ 34	\$ 0	\$ 0
Stepper Motor	\$ 36	\$ 36	\$ 0	\$ 0
Threaded Rod	\$ 2	\$ 2	\$ 0	\$ 0
<b>Total</b>	<b>\$ 602</b>	<b>\$ 272</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Alternative Fuels Team (UWAFT)

S18-1314



## Dynamic Spoiler Parts Funding

*Vaibhav Patel*

*Mechanical Co-Lead, Alternative Fuels Team (UWAFT)*

*vaibhav.n.patel@uwaterloo.ca*

### Description of Proposal

The team is currently working towards adding a dynamic spoiler to our vehicle. This funding will help us get hardware to finish our electrical architecture for the project.

### Proposal Benefits

Able to integrate a moving spoiler by being able to power and control movement of linear actuators.

### Estimated Equipment Lifetime

### Implementation Schedule

Project is scheduled to be finished before the end of the summer term.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Relay Module	\$ 25	\$ 0	\$ 0	\$ 0
Mini Step-Up Transformer	\$ 30	\$ 0	\$ 0	\$ 0
Arduino UNO Power Cable	\$ 15	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 70</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Robotics Team (UWRT)

S18-1317



## University of Waterloo Robotics Team Mars Rover

*Ho Jin Mok*

*Team Lead, Robotics Team (UWRT)*

*hjmok@uwaterloo.ca*

### Description of Proposal

The University of Waterloo Robotics Team is a participant of the annual University Rover Challenge (URC), which is a competition focused on building a semi-autonomous Mars Rover robot that undergoes a series of tasks, such as object collection and delivery, soil analysis, and terrain traversal. The design team is comprised of approximately 45 active undergraduate students of all years and programs, which is a gradual increase from previous years. In URC 2017, the team has proudly placed 15th globally and 2nd in Canada. Furthermore, the team placed 22nd of the 95 teams that applied to URC 2018 competition.

The UW Robotics Team anticipates competing in the URC 2019, and our design cycle for next year is just about to begin. Reflecting back on the URC 2018 competition results, one of the problems our team faced was a lack of a capable depth camera. For the Autonomous Traversal task, we require a camera that will be able to detect objects. Unfortunately, our current one, Duo MLX, is poorly designed for outdoor usage. As such, we are requesting funds for a new depth camera, specifically the ZED camera.

One of the main projects for the 2019 design cycle will be redesigning our rover's suspension. Our current suspension system has been in service for the last 2 years, proving to be an effective method of maneuvering around the Utah desert where the URC is held. Unfortunately, damage has been taken from mechanical wear and blunt forces during competition activities, making our current suspension system unusable for 2019. As such, we are requesting funding for our rocker-suspension system redesign project for the 2018-2019 academic year.

### Proposal Benefits

The UW Robotics team has proven to be a great educational ground for undergraduate students interested in robotics for over a decade as one of the most iconic student teams in Waterloo. With WEEF's funding, UWRT can continue to participate in university events such as Open House, Frosh Week, and Engineering Outreach events.

About a quarter of the team are from the ME department, and are interested in mechanical design. The suspension redesign will be a highly practical mechanical design project that will have education benefits for multiple members of our team. Similar to the current suspension system, the 2019 redesigned chassis will utilize a differential, drivetrain, gearbox, motors, and has the potential for a rocker bogie system. All these components will allow our students to experience the design process for a complex mechanical system. Moreover, optimization will be next year's focus, as more FEA and Solid Mechanics will be implemented to minimize the weight and maximize the maneuverability of our suspension. Lastly, our mechanical team will be working heavily with the electrical team in terms of designing for wiring and electrical outputs. This will allow both teams to learn more in depth on a systems design engineering level.

Autonomy is a huge aspect of the team, as well as a rapidly growing market that many of our software members are interested in. The ZED camera will be used for the Autonomous Traversal task of the University Rover Challenge. As such, members of our software team will be able to gain experience and skills in programming for autonomy.

### Estimated Equipment Lifetime



The suspension system itself is planned to be in service for another 3-4 years. The mechanical components of the chassis, such as sprockets and gears, will be usable for around 5 years.

The ZED camera is anticipated to last us for the next 5+ years.

### Implementation Schedule

Redesign of the suspension system will commence this term in July. The design process itself is expect to take up to 5-6 months until the end of F18, and assembly will start in W19 term. Parts for assembly are planned to be purchased in December 2018.

Software team will begin the Autonomy project in September 2018.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Suspension System Project	\$ 1300	\$ 1150	\$ 1000	\$ 0
ZED Depth Camera	\$ 700	\$ 600	\$ 500	\$ 0
<b>Total</b>	<b>\$ 2,000</b>	<b>\$ 1,750</b>	<b>\$ 1,500</b>	<b>\$ 0</b>

# Robotics Team (UWRT)

S18-1318



## UW Robotics Team Reallocation Proposal

*Ho Jin Mok*

*Team Lead, Robotics Team (UWRT)*

*hjmok@uwaterloo.ca*

### Description of Proposal

The University of Waterloo Robotics Team (UWRT) is a participant of the annual University Rover Challenge (URC), which is a competition focused on building a semi-autonomous Mars Rover robot that undergoes a series of tasks, such as object collection and delivery, soil analysis, and terrain traversal. The design team is comprised of approximately 45 active undergraduate students of all years and programs, which is a gradual increase from previous years. In URC 2017, the team has proudly placed 15th globally and 2nd in Canada. Furthermore, the team placed 22nd of the 95 teams that applied to URC 2018 competition.

In the W17-1101 term, UW Robotics Team requested funding for an ATX Power Supply and WEEF granted \$271. However, this funding has not yet been used. Instead, UWRT would like to reallocate this resource to purchase a Variable Power Supply. Our current power supplies can only deliver a maximum of 1 A over 6 V. However, our motors run at 12 V and can draw up to 22 A, thus effective testing cannot occur with our current equipment. As such, a variable power supply would be highly useful for our electrical team. Moreover, the previously requested ATX Power Supply was intended for the exact same function as the newly requested Variable Power Supply. However, Variable Power Supplies are more convenient, as they can provide different voltage levels, so DCDC converter is not required. This makes it much easier to test different equipments that may require different voltages.

### Proposal Benefits

The UW Robotics team has proven to be a great educational ground for undergraduate students interested in robotics for over a decade as one of the most iconic student teams in Waterloo. With WEEF’s funding, UWRT can continue to participates in university events such as Open House, Frosh Week, and Engineering Outreach events.

Leading up to the 2018 University Rover Challenge competition, our electrical team had trouble testing our motors and various electrical equipment. This was due to our current power supplies not providing enough current and voltage for testing. A Variable Power Supply would have made testing far more convenient. Furthermore, the voltage and currents can be changed in a Variable Power Supply, unlike an ATX Power Supply. This would mean there is flexibility in testing future motors with different specs.

### Estimated Equipment Lifetime

10+ years

### Implementation Schedule

A variable power supply is already picked out and ready to be purchased immediately after reallocation approval.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
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Flir Commercial Systems - Power Supply; Benchtop;	\$ 271	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 271</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Rocketry Team

S18-1333

## Waterloo Rocketry - S18 Proposal



*Jacob Deery*

*Operations Lead, Rocketry Team*

*jacob.deery@uwaterloo.ca*

### Description of Proposal

Waterloo Rocketry is a student team specializing in the development of hybrid rockets. We compete annually at the Spaceport America Cup with more than 100 teams from across the globe. Our work comprises design, manufacture, and testing of vehicle and ground support systems.

We recently flew our new rocket Unexploded Ordnance (UXO) at competition, winning first place in our category for the second consecutive year. We attained an altitude of 13412 feet, which is the highest altitude that the team has ever reached and the highest out of any hybrid or liquid rocket at this year's competition. We intend to build on our success by optimizing our core subsystems and iterating on our design for more advanced capabilities.

We are requesting funding for the following categories:

#### 1. Avionics

Our avionics systems allow us to control our engine, recovery electronics, and payload prior to and during flight. Our focus this year will be on repairing and upgrading systems that were damaged during this year's flight and adding enhanced capabilities for communication and data processing. These systems are expected to persist for the lifetime of the launch vehicle and form a backbone for future development.

#### 2. Composite fabrication

The team would like to replace aluminum components in our airframe with custom composite parts in order to decrease the overall weight of our rocket. Funding for this category will be used to purchase fiberglass, epoxy, and other composite fabrication materials.

#### 3. Electrical fabrication tools

Our team would like to be able to more efficiently and reliably fabricate and assemble the numerous electrical systems on our rocket and in our ground equipment. Tools such as a hot air rework station and soldering clamps will allow us to more accurately assemble and repair the PCBs we use in our systems.

#### 4. Plumbing

Our propulsion and ground systems feature networks of hoses, valves, and fittings necessary for managing propellant loading and venting. In order to support more sophisticated plumbing configurations and capabilities, we will need additional basic components as well as specialized fittings for attaching to tubes, gas cylinders, and sensors.

### Proposal Benefits

#### 1. Avionics



Avionics systems include all flight electronics, from the sensors that monitor our engine for flight readiness to the altimeters that deploy our parachutes. Robust and reliable avionics systems are critical to ensuring that our rocket is able to achieve the baseline objectives of launch and recovery. More sophisticated avionics are necessary for control of advanced propulsion systems and flight data acquisition, essential for optimizing our vehicle and remaining competitive.

## 2. Composite fabrication

The most notable advantage of using composite materials is weight reduction, which improves overall flight performance. In addition, composite materials are stronger and more flexible than aluminum. The reduced weight of composite parts will allow us to spend more of our mass budget on functional modules such as our propulsion and avionics systems.

## 3. Electrical fabrication tools

Upgrading our fabrication tools will allow us to dedicate more time to designing and upgrading our electrical systems rather than repairing and troubleshooting. We will also be able to save money by repairing damaged boards instead of replacing them.

## 4. Plumbing

Many of our current plumbing components are old and rusted and are difficult to clean and assemble. Replacing these components makes our plumbing system more reliable and longer lasting. Upgrading our system will allow us to increase the sophistication and performance of our propulsion system, which is necessary for achieving higher altitudes and launching larger rockets.

## **Estimated Equipment Lifetime**

### 1. Avionics

Upgrades to our avionics systems will be iterations on our previous baseline designs. They should last for the lifetime of our launch vehicle, which we anticipate as an additional three to four years.

### 2. Composite fabrication

The supplies we will purchase this year will be used to fabricate parts for the next iteration of the rocket. We will aim to use these parts for as long as possible and expect that they will remain part of the airframe for two years.

### 3. Electrical fabrication tools

All of the tools purchased will be commercial and high-reliability and we do not anticipate replacing them in the next five years.

### 4. Plumbing

Funding for this category will be used to purchase fittings that will not rust and will be long-lasting. We hope to avoid replacing these fittings for the next five years.

## **Implementation Schedule**



1. Avionics
2. Composite fabrication
4. Plumbing

Component purchases will begin towards the end of S18 and beginning of F18 as our projects for the 2018-2019 cycle become finalized.

3. Electrical fabrication tools

Tools will be purchased immediately after funding is received.

#### **Additional Information**

None.

#### **Cost Breakdown**

<b>Item</b>	<b>Option1</b>	<b>Option2</b>	<b>Option3</b>	<b>Option4</b>
Avionics	\$ 2200	\$ 1800	\$ 1400	\$ 1000
Composite fabrication	\$ 1000	\$ 800	\$ 600	\$ 400
Plumbing	\$ 800	\$ 650	\$ 500	\$ 350
Electrical fabrication tools	\$ 600	\$ 500	\$ 400	\$ 300
<b>Total</b>	<b>\$ 4,600</b>	<b>\$ 3,750</b>	<b>\$ 2,900</b>	<b>\$ 2,050</b>

# Waterloo Aerial Robotics Group (WARG)

S18-1342



## Waterloo Aerial Robotics Group S18 Proposal

*Mark Dunk*

*Team Lead, Waterloo Aerial Robotics Group (WARG)*

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### Description of Proposal

The Waterloo Aerial Robotics Group (WARG) is a team of passionate students developing autonomous aerial vehicles capable of performing various tasks. WARG intends to compete in the annual AUVSI Student UAS competition, in June 2019.

WARG is requesting sponsorship for a new soldering and rework stations, new autopilot boards, and a tool chest.

### Proposal Benefits

WARG's first priority is student learning, and prides itself in designing and building every aspect of the system from scratch. From the custom designed board that runs the autopilot, the autopilot itself, our image processing suite, our network infrastructure systems including the ground station and tracking antenna and now soon the custom composite airframe, it is sufficient to say that our members get the utmost raw exposure to everything it takes to build an unmanned aircraft. As such we give all our members the opportunity to work on any of the above projects, providing them with invaluable, applicable experience.

WARG is requesting funding for a new soldering station. We are currently using a soldering iron graciously lent by a member after the death of our old station. The requested solder station is a JBC CD-B, a high quality, high power tool. This new station will decrease the production time of our electrical projects, especially our new autopilot boards. Additionally, the higher thermal capacity will make working on boards with large ground planes, such as our high-current power distribution board, significantly easier. The auto-cooldown feature reduces wear on the iron and reduces the chances of members inadvertently touching a hot iron.

In conjunction with a new soldering station, a hot air rework station would vastly improve WARG's autopilot development. Our autopilot board utilizes two microcontrollers with 144 and 64 pins respectively. A hot air station eliminates the need to solder each pin individually. It also allows for the reuse of IC's between board revisions, resulting in a lower BOM cost. Lastly, it provides a source of temperature controlled hot air for shrinking heatshrink or reducing the cure time of epoxies.

WARG is currently developing its next generation of autopilot. By designing our own autopilot, we give our members a unique opportunity to gain experience in embedded circuitry design, pcb design, and soldering a variety of package styles. WARG is requesting sponsorship for this set of autopilot boards. The requested funding sufficient for six complete autopilot boards.

Currently, WARG stores all of its tools in toolboxes. This occupies valuable table space, space that could otherwise be used for projects. To free up up this space, we are requesting funding for a tool chest. The chest will have sufficient capacity for all of our current tools as well as any new acquisitions for several years. By storing all of the tools in a singular location, productivity can be increased by reducing the time spent finding the correct tool.

WEEF is currently in our highest sponsorship bracket. This proposal will allow WEEF to continue to be a "High Flyer" sponsor. Being a High Flyer means that a large WEEF logo will be added to our aircraft, website and on team apparel.



### Estimated Equipment Lifetime

The estimated lifetimes for the soldering station and tool chest are approximately 8 years, while the hot air rework should last at least 5 years, and the autopilots will be competitive for at least 4 years.

### Implementation Schedule

WARG will be purchasing all items in late Spring to mid Fall 2018.

### Additional Information

Team Website: [www.uwarg.com](http://www.uwarg.com)

Photos: [www.flickr.com/photos/uwarg](http://www.flickr.com/photos/uwarg)

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Soldering Station	\$ 800	\$ 800	\$ 700	\$ 700
Tool Chest	\$ 650	\$ 500	\$ 250	\$ 0
Hot Air Rework Station	\$ 375	\$ 375	\$ 375	\$ 0
Autopilot Boards	\$ 675	\$ 500	\$ 250	\$ 0
<b>Total</b>	<b>\$ 2,500</b>	<b>\$ 2,175</b>	<b>\$ 1,575</b>	<b>\$ 700</b>

# UW Formula Motorsports

S18-1341

## UWFM Engine

*Akmal Syed*

*Business Lead, UW Formula Motorsports*

*ma3syed@uwaterloo.ca*



### Description of Proposal

This term's proposal aims to acquire a tool chest set for the team's bay. The team has expanded its power tool collection in the last 2 years. This is in part due to the development of its composites program.

### Proposal Benefits

A new tool chest would significantly increase the organization within the bay.

### Estimated Equipment Lifetime

Current toolboxes have been around 10+ years.

### Implementation Schedule

To be purchased immediately, bay reorganization is to be complete before Fall term.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Mastercraft 7-Drawer Cabinet, 36-in	\$ 791	\$ 593	\$ 395	\$ 0
Mastercraft 6-Drawer Chest, 36-in	\$ 565	\$ 424	\$ 283	\$ 0
<b>Total</b>	<b>\$ 1,356</b>	<b>\$ 1,017</b>	<b>\$ 678</b>	<b>\$ 0</b>

# Waterloo Architecture Students Association (WASA)

S18-1343



## Vacuum Thermoformer

Thomas Noussis

4B WEEF Representative, Waterloo Architecture Students Association (WASA)

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### Description of Proposal

1 Vacuum-Thermoformer. \$1939.99

<https://www.robotshop.com/ca/en/centroform-ezform-sv-1217-tabletop-vacuum-forming-machine.html>

Currently, there are a number of students engaged each term in the making of moulds (Arch 393, Arch 493). This is done by heating acrylic in a toaster and forming it with scratch built vacuum tables, to which a household or shop vacuum is rigged up. These solutions are ad-hoc, and limited in size to the toaster oven. Moreover, their use is quite difficult, and inconsistent.

### Proposal Benefits

The purchase of a purpose built equipment for the use would support both independent student work, and expand the range of projects that can be done in the digital fabrication stream, enabling production of large scale, reusable moulds. It would also support the work done by students in other fabrication elective courses, as well as studio design courses in which fabrication and experimental model-making are central activities.

(Arch 393 Optional Design studios, Arch 293, Arch 113)

The Thermoformer would support the creation of moulds for mass production purposes in conjunction with other digital fabrication equipment. Paring it with the CNC to create a negative of a milled form for casting and reproduction, would allow the fabrication of installations or research projects requiring the creation of a large number of similar components. This work could range from the simple to the complex, but the use of the CNC is quite limited to smaller production runs.

### Estimated Equipment Lifetime

Very simple and robust piece of equipment. This could last 20 years easily, if it wasn't abused

### Implementation Schedule

Shop Space is available, and the 220 Volt hookup is already installed. This equipment could be immediately used if approved.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Thermoformer	\$ 1940	\$ 2680	\$ 0	\$ 0



	<b>Total</b>	<b>\$ 1,940</b>	<b>\$ 2,680</b>	<b>\$ 0</b>	<b>\$ 0</b>
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# Formula SAE Electric

S18-1336



## Waterloo Formula Electric S18 Tools

*Nicholas Qu*

*On-Stream Team Lead, Formula SAE Electric*

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### Description of Proposal

Waterloo Formula Electric (Formerly Formula Hybrid) is a student-run design team dedicated to engineering electric racing vehicles for competition. It has a long history of success, coming first in the Autocross, Endurance, and Overall in Hybrid categories in the 2015 SAE Hybrid Competition. We provide students with well-rounded educational opportunities in design and implementation, along with co-op opportunities and project/financial management experience. The goal of Formula Electric is as much about propelling our students and improving their careers as it is to make electric vehicles. We intend to continue our long tradition of representing Waterloo abroad and making our students better members of the Waterloo community.

The 2019 Formula Electric SAE competition will be occurring in June 2019, and as such Formula Electric needs to procure the remaining equipment to complete the build and testing of our car. We are requesting tools that will be integral to our success in June. These tools have been identified as having the highest value for the team, and have been selected over a number of other product candidates for their reliability and price.

To help validate our custom battery monitoring system, we will require a cell simulator that will allow us to modify the voltage of cells to test the accuracy of our voltage measurement system, which will cost \$7600. In addition, to properly create connectors, we need LEAVYseal crimp connectors, which will cost \$1500. Finally, because we switched from imperial to metric, we will need new bearings/rod ends which will be used for years to come.

### Proposal Benefits

- Design, manufacturing, and management experience for over 60 undergraduate students
- Student networking with industry sponsors
- Connects Upper/Lower year students for mentorship
- Brings more co-op partners to Waterloo engineering
- Understanding the full engineering development cycle from conceptual to manufacturing to testing
- Multidisciplinary (electrical and mechanical) engineering

### Estimated Equipment Lifetime

Crimp Tools (Main Priority: ERGOCRIMP Hand Tool Frame, MCP 1.5 Die, MCP 2.8 Die) - 15 years

Rod Ends/Bearings - 5 years

Cell Simulator - 7 years

### Implementation Schedule

The crimp tools, rod ends/bearings, and battery simulator will be purchased as soon as possible for use from the date of their purchase up to and during the competition in June. Their use will extend past this year into future iterations of the car.

### Additional Information

Prices shown reflect discounted prices that we have negotiated with vendors, where possible.

Sharing of tools within the SDC is permitted upon request.



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Rod Ends/Bearings	\$ 400	\$ 400	\$ 500	\$ 500
Bloomy Cell Simulator	\$ 7500	\$ 0	\$ 7500	\$ 0
Crimp Tools (Priority)	\$ 1700	\$ 1700	\$ 1500	\$ 1500
<b>Total</b>	<b>\$ 9,600</b>	<b>\$ 2,100</b>	<b>\$ 9,500</b>	<b>\$ 2,000</b>

# Waterloo iGEM

S18-1340

## iGEM 2018 WEEF Funding Proposal



*Sajeda*

*Finance Lead, Waterloo iGEM*

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### **Description of Proposal**

Waterloo iGEM is an undergraduate synthetic biology team that consists of students from all faculties, with a large portion of them coming from Engineering. Our team is split into 4 subteams - mathematical modelling, lab and design, policy and procedures, and finance. The team works on a synthetic biology project that tackles real-world problems using biological engineering principles, and presents their work in iGEM jamboree with ~240 other competing international institutions.

Waterloo iGEM is requesting WEEF's support of up to \$200 towards purchasing a caliper, used for the precise and accurate measurements of items we need to 3D print. We are also requesting \$400 that will go towards chemicals, fabrication, and other equipment. Any sponsorship will be recognised and advertised by the team in a few ways (as mentioned below).

### **Proposal Benefits**

Biological engineering is an emerging and interesting field of study, and is of great interest to many students and faculty on campus. The work we do in Waterloo iGEM gives engineering students the chance to learn new content about synthetic biology systems while significantly contributing to a revolutionary research and design project. What makes our team different is the student leadership that is evident in the project and experimental design. All students on our team are given the opportunity to experiment with all areas of the project and are trained beforehand. We provide training in several topics such as hands-on lab experience, mathematical modelling in Python & MATLAB, and Arduino programming.

The lab equipment requested is necessary to give students a hands-on experience in the lab and to help our team meet project deadlines. It also gives our team the ability to perform accurate measurements, which is crucial for the success of our experimental results, and overall project.

The aid of WEEF is recognised through a variety of outlets to show your support for student initiatives, such as your logo on our team T-shirts, website, and student poster (presented at the international jamboree).

### **Estimated Equipment Lifetime**

Calipers have a long lifetime of roughly 10+ years.

For the other items, however, we'd probably be using the chemicals and fabrication for the 2018 project. This amount may also go towards partially funding long-lasting equipment, however, such as a scale, which has a lifetime of roughly 10 years.

### **Implementation Schedule**

If funding is approved, we will be purchasing and using these items anytime from time of approval to the end of Fall 2018.

### **Additional Information**

None.



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Items (chemicals, fabrication, other equipment)	\$ 400	\$ 200	\$ 200	\$ 0
Caliper	\$ 200	\$ 200	\$ 0	\$ 0
<b>Total</b>	<b>\$ 600</b>	<b>\$ 400</b>	<b>\$ 200</b>	<b>\$ 0</b>

# University of Waterloo Finance Association (UWFA)

S18-1335



## University of Waterloo Finance Association

*Phillip Feng*

*Finance Analyst, University of Waterloo Finance Association (UWFA)*

*ryfeng@edu.uwaterloo.ca*

### **Description of Proposal**

The University of Waterloo Finance Association (UWFA) is a student run organization dedicated to providing an environment which encourages and enhances student interest in the financial industry. As such, UWFA provides weekly events throughout every study term to their members which includes trading workshops, real-time trading simulations, resume critiques, mock interviews, and career panels.

The main event we are proposing for is our Stock Pitch Competition. The University of Waterloo's Stock Pitch Competition is a one-day annual event that brings together Canada's top stock pitches. As such, the competition is an interuniversity competition with participating schools such as Western University's Ivey School of Business and Queen's University's Smith School of Business and hence provides great exposure for participating students from the Faculty of Engineering. This is a great opportunity for students to experience firsthand the rigorous processes that drive a strong stock pitch and present their work to industry professionals. Prior to our competition, we host numerous workshops for our members to improve their stock pitches such as how to craft a pitch, tips for success, demonstrations of a successful pitch from our executives, and technical aspects of pitches such as the different valuation methods. Stock pitches are a pivotal element of many front office finance interviews such as Sales and Trading and Equity Research roles. Hence, our stock pitch workshops and competitions will allow our members to be able to hone their stock pitches and succeed in their interviews. Due to the structured nature of UWFA's events, it is imperative that they secure funding in advance to every study term in order to ensure their events run undisrupted. As a result, they have been able to introduce new students to finance, facilitate networking opportunities between members and industry, and provide members with practical knowledge applicable outside of the academic setting.

### **Proposal Benefits**

The rigorous and technical nature of an engineering degree provides a desirable background for candidates entering the financial industry. As such, there have been numerous engineers at the University of Waterloo whom have decided to pursue a career in finance. We want to be able to provide these engineering students with insight into capital markets and high finance that they may not be exposed to in an engineering setting. This will allow them to become familiar with the industry and recruitment process as well as provide them with practical experience in areas such as Stock Pitches, Excel, Bloomberg, and careers in Finance etc.

### **Estimated Equipment Lifetime**

We know it is out of the ordinary for WEEF to fund events and hence in this situation, we would be interested in funding for a club laptop which would be used for work regarding the events UWFA hosts. The sole purpose of this laptop will be for the club and hence we would also be able to store club information on this laptop rather than on our executives' personal laptops. Due to the longevity of a laptop, we anticipate it to last anywhere from 3-5 years.

### **Implementation Schedule**

Once funding for the club laptop is finalized, we would be able to use the club laptop immediately. All sensitive data will be transferred to this laptop and our VPs will be able to work on upcoming events exclusively on this laptop in order to separate UWFA work from personal work.



**Additional Information**

N/A

**Cost Breakdown**

<b>Item</b>	<b>Option1</b>	<b>Option2</b>	<b>Option3</b>	<b>Option4</b>
Club Laptop	\$ 1000	\$ 850	\$ 700	\$ 500
<b>Total</b>	<b>\$ 1,000</b>	<b>\$ 850</b>	<b>\$ 700</b>	<b>\$ 500</b>

# Concrete Toboggan & Canoe

S18-1322



## UW Concrete Team - WEEF Proposal S18

*Joëlle Dumouchel*

*Finance Lead, Concrete Toboggan & Canoe*

*uwconcreteteam@uwaterloo.ca*

### Description of Proposal

The UW concrete team would like to receive funds for various equipment to be able to build concrete canoes and toboggans for years to come. With WEEF's help, we would like to procure new angle grinder parts, a new angle grinder, measuring cylinders, measuring tapes and round and square hand files.

### Proposal Benefits

These items would greatly improve the fabrication of our canoes and toboggans. The new set of measuring cylinders would allow us to accurately measure all of the necessary additives for the concrete mixes. Carpenters often say "measure twice, cut once" which is a maxim that the measuring tapes would allow us to follow resulting in fewer errors and a better product overall. The angle grinder and hand files would greatly help us in the fabrication of the metal frames of the toboggan and allow us to have a better finished product for competition.

### Estimated Equipment Lifetime

The measuring cylinders, measuring tapes, angle grinder and parts should last between 15-20 years. The round and square hand files should last about ten years.

### Implementation Schedule

We would like to purchase all these items by the beginning of September to be able to start production of our toboggan for the January 2019 competition.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Angle Grinder and parts	\$ 75	\$ 5	\$ 0	\$ 0
Measuring cylinders	\$ 15	\$ 0	\$ 0	\$ 0
Measuring Tapes	\$ 14	\$ 7	\$ 0	\$ 0
Hand files	\$ 60	\$ 30	\$ 0	\$ 0
<b>Total</b>	<b>\$ 164</b>	<b>\$ 42</b>	<b>\$ 0</b>	<b>\$ 0</b>

# UW Steel Bridge Team

S18-1310



## Spring 2018 UW Steel Bridge Team Sponsorship

*Stephan Marlés Werner*

*Finance Captain, UW Steel Bridge Team*

*scmarles@edu.uwaterloo.ca*

### Description of Proposal

As the Finance Captain of the UW Steel Bridge Team, we are requesting a sponsorship from the WEEF committee for new safety/ welding equipment to improve our methods of construction on represent the university in higher regard with more complex bridge designs. This will be done through the purchase of new welder helmets, jackets and gloves.

### Proposal Benefits

Benefits will be towards the Civil/Eviro/Geo Engineering Students who have a strong drive to participate in the steel/infrastructure industry. Team members will be able to participate in the industrial construction of members and joints. The team is currently very limited to 2 members welding at once and require more safety equipment to have more member participating. With more tools such as the welding helmet, jackets and gloves, more students will be able to participate, hands on, than observe from a safe distance. With more experienced welders, through practice sessions, the team will be able to create more meticulous joints and members that will greatly increase the University of Waterloo's presence in competitions.

Benefits:

1. More welding practice can happen as more user can participate
2. Rate at which members can become more proficient in the trade increase
3. More complex joints and members can be assembled
4. Faster construction time than usual
5. Will serve 50 members that keep increasing per year

### Estimated Equipment Lifetime

VIKING™ 1840 Black Welding Helmet - 7 years

Lincoln Welding Jacket - 10 years

Mastercraft Leather Welding Glove - 10 years

Overall, with proper care and maintenance, +10 years.

### Implementation Schedule

Spring 2018 term

### Additional Information

Sponsorship Levels

Bronze \$100 - \$499

- Company logo displayed on team website, annual photo and certificate of the team



Silver \$500 - \$1499

- Bronze benefits, Company logo printed on sponsor board which is presented at all events

Gold \$1500 - \$2499

- Silver Benefits, a team t-shirt, logo printed on team t-shirt which is prominently displayed at all events

Steel +\$2500

- Gold benefits, company logo displayed on the front of the team website and all social media outlets, sponsorship gift that includes video of competition and a plaque from the team

Title Sponsorship 5000

- Steel benefits, company name and logo presented along team name at all events and media, logo placed on team hard hats, 3-dimensional printed model of the bridge

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
VIKINGâ,,ç 1840 Black Welding Helmet	\$ 614	\$ 312	\$ 312	\$ 0
Lincoln Welding Jacket	\$ 294	\$ 294	\$ 147	\$ 0
Mastercraft Leather Welding Gloves	\$ 46	\$ 0	\$ 46	\$ 0
<b>Total</b>	<b>\$ 954</b>	<b>\$ 606</b>	<b>\$ 505</b>	<b>\$ 0</b>

# Waterloo Submarine Racing Team

S18-1332



## Waterloo Submarine Racing Team Proposal (W2018)

*Allyson Hildebrandt*

*Team Lead, Waterloo Submarine Racing Team*

*ajhildeb@edu.uwaterloo.ca*

### Description of Proposal

The Waterloo Submarine Racing Team (WatSub) is Ontario's first human-powered submarine racing team, and one of very few active Canadian teams. We design, manufacture, test, and race the submarine internationally. The team is formed by students who share a passion to push their technical boundaries and seek inventive ideas - in line with the true spirit of the Faculty of Engineering at the University of Waterloo. WatSub is an opportunity to showcase unique talents in the quest to become an international competitor in submarine racing. The team looks to integrate individuals from different engineering disciplines into an exciting new challenge that requires original and comprehensive solutions. We are currently seeking equipment for our team. This equipment would allow us to continue the design, testing, and racing of our third submarine, named Claire. Its two predecessors, AMY and BOLT, competed in the 2016 European International Submarine Races (eISR) and 2017 International Submarine Races (ISR), respectively. A description of the items and associated cost follows:

1. Joystick - \$180 - for controls system of submarine
2. Waterproof enclosures - \$250 - for controls system of submarine
3. Servo motors - \$170 - for controls system of submarine
4. New safety glasses and glasses cases - \$150 \*cases to avoid scratching
5. Bin organizers - \$70 - to organize small electronics parts

### Proposal Benefits

We design, fund, manufacture, test, and race a human-powered submarine, with every step of this process done by UW students. This means exclusive learning opportunities for students, such as composites monocoque manufacturing, propeller design and optimization, advanced hydrodynamics, and many others. Our team consists of engineering students from a variety of engineering disciplines and skill levels with varying levels of time commitment, making the team inclusive and open to all students - independent of their background, experience, or schedule. The safety glasses benefit the whole team, allowing people to work as safe as possible; the cases for the glasses prevent scratching, so the glasses will be usable for longer. The equipment for the controls system is all reusable for future years. For sponsorships over \$500, WatSub will include the WEEF logo on our website, t-shirts, and submarine.

### Estimated Equipment Lifetime

1. Joystick - 3 years
2. Waterproof enclosures - 2 years
3. Servo motors - 2 years
4. Safety glasses and cases - 3 years
5. Bin organizers - 5 years

### Implementation Schedule

All items would be purchased as soon as possible or have already been purchased, as they are necessities. We endeavor to have these purchases made by October 2018.



### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Joystick	\$ 180	\$ 0	\$ 0	\$ 0
Waterproof enclosures	\$ 250	\$ 0	\$ 0	\$ 0
Servo motors	\$ 170	\$ 0	\$ 0	\$ 0
Safety glasses and cases	\$ 150	\$ 0	\$ 0	\$ 0
Bin organizers	\$ 70	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 820</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>



## **Hack The 6ix Proposal**

*Umesh Kumar Akash Khanna*  
*Vice President , UW DECA*  
*umesh.khanna@uwaterloo.ca*

### **Description of Proposal**

Hack the 6ix is Toronto's premier summer hackathon. We are the first event of the MLH 2018-2019 season. We are student run, and many of our organizers study at the University of Waterloo.

For our event this summer, we will take place from August 24th-26th, at the trendy downtown office of Top Hat. We are sponsored by a diverse group of established tech companies, startups, and financial firms in Toronto.

The purpose of this proposal is to request funding for equipment and food for the event. We believe that engineering students at the University of Waterloo will make up a large percentage of the participants at the event. Last year, UW students made up ~40% of participants at Hack the 6ix. With the larger numbers of participants this year, we anticipate that the delegation from Waterloo will be even bigger.

### **Proposal Benefits**

The arduinos that we could purchase with the funding would be highly beneficial to the participant experience of Hack the 6ix, a vast percentage of which are from UW engineering. The provision of hardware would allow students to move off of purely software based projects and allow them a broader range of tools to use. Arduinos are able to be used with a wide variety of languages and software, and are extremely scalable from being a small part of a project to the main body of it.

The funding for the catered meal will also have tremendous use in feeding and sustaining the participants during the event. With the money we would be able to purchase a healthier alternative to something like Pizza.

### **Estimated Equipment Lifetime**

The arduinos will allow participants to have access to a unique hardware product which expands the range of projects that they will be able to build. Rather than being limited to software only projects and applications, hackers can integrate with the Arduino board. This creates a more rewarding and educational experience for the participants.

### **Implementation Schedule**

The arduinos will last for the duration of the weekend of the hackathon, as students who use them for their projects will be allowed to take them home.

### **Additional Information**

Cost breakdown:  
1 catered meal - \$500  
50 arduinos - \$1,000

### **Cost Breakdown**

Item	Option1	Option2	Option3	Option4
Catered Meal	\$ 500	\$ 0	\$ 0	\$ 0
Arduinos	\$ 1000	\$ 0	\$ 0	\$ 0



	<b>Total</b>	<b>\$ 1,500</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>
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# Autonomous Sailboat (UWAST)

S18-1319

## UW Sailbot Spring 2018

*Lily Liu*

*Business Lead, Autonomous Sailboat (UWAST)*

*l83liu@uwaterloo.ca*



### Description of Proposal

UW Sailbot designs, builds, and programs autonomous wind-powered vessels to compete in the International Robotics Sailing Regatta (IRSR). The team grew from just five core members last year to 10 core members and 20 general members from more than 7 programs.

Just the past month, the team competed at the IRSR in Worcester, MA and placed 4th overall, with 2nd in collision avoidance, 2nd in presentation, and 3rd in endurance race! Compared to last year, the team competed for the first time and ranked 6th out of 11 teams, which is a huge improvement. Tackling IRSR 2019, the team aims to focus on modifying the 2018 boat to increase its autonomy and speed. In addition, the team will focus on knowledge integration and help general members get more involved.

For Spring 2018, UW Sailbot wants to request the following from WEEF: LiPo charger (\$75), respirators (\$270), drill and driver kit (\$300), bench clamp (\$150), electrical power board (\$100), Rework Station (\$190), High temperature polyimide tape (\$85), oscilloscope (\$700), electronics repair kit (\$110), Odroid (\$140), and a monitor (\$180). The reasons behind buying these items are explained in the following paragraphs.

### Proposal Benefits

We are the University of Waterloo's first autonomous aquatic vessel team. As wind-powered vessels, sailboat dynamics are a unique and fun engineering challenge requiring skills not found on any other student design team. Over 30 team members learn about hull design, hydrodynamics, and aerodynamics through the design and manufacturing of custom hulls. This is in addition to experience with power electronics, electric motors, and sensor integration. There's no other student design team at UW who autonomously navigates on the sea; it is truly a different challenge to land navigation. Path planning, location recognition, embedded programming, machine learning, and computer vision are the fields central to our team mission. The team also gets many social media exposures, such as being featured on the CTV for our boat launch at the Connestoga sailing club. In addition, the team helps the university promote the engineering program by presenting at Open House, SDC events, Alumni Reunion, etc.

**LiPo charger (\$75):** The team uses two LiPo batteries to power all the electronics on the boat. Using a proper LiPo charger for the batteries will prevent battery fire and extend battery life.

**Respirators x2 (\$200):** The recruitment season is coming in September. The team plans to host composite workshops for new members, which requires them to wear respirators. More respirators will allow more students to come to the workshop.

**Drill and Driver Kit (\$300):** The hand drill is used by the electrical team and mechanical team all the time. There is a need for a second drill so that the two teams can work at the same time during testing days. In addition, we use lock nuts, which takes a long time to fasten. A driver will reduce the assembly/disassembly time by half.

**Bench Clamp (\$150):** When modifying components in the bay while the machine shop is closed, orientating the part in the correct way and clamping it properly will ensure accurate dimensions and operation safety.



Electrical power board (\$100): The team plans to design our own custom power boards again, which will require 30+ different components. This power board ensures that the batteries are supplying power at the proper voltage and current to the rest of the electrical system.

Hot Air Rework Station (\$190): Because some electrical boards and wire connections need to be modified for the next competition, old components need to be taken off and re-soldered. A rework station enables the team to take off the old components without damaging other components on the board.

Odroid (\$140): All system processing is done by the Odroid on board, which is essentially the motherboard for the boat to achieve sailing autonomy.

Monitor (\$180): A monitor is needed to develop our vision system. The monitor will display what's seen with the boat's cameras during testing to complete the collision avoidance challenge at competition.

Oscilloscope (\$700): It will be used to test the switching regulators. The oscilloscopes in electronics room are not readily usable because they don't have leads. In addition, it has to be taken to our testing location for testing days. Therefore, it would be beneficial for the team to have its own oscilloscope.

### **Estimated Equipment Lifetime**

LiPo charger: 5 years+

Respirators: 4 years+

Drill and driver kit: 10 years+

Bench clamp: 10 years+

Electrical power board: 1 competition year

Hot air rework station: 5 years+

Odroid: 2 competition years

Monitor: 5 years+

Oscilloscope: 10 years+

### **Implementation Schedule**

All purchase will be made immediately as soon as the approval is given.

### **Additional Information**

None.



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
LiPo Charger	\$ 75	\$ 75	\$ 0	\$ 0
Respirators	\$ 200	\$ 200	\$ 200	\$ 0
Drill and driver kit	\$ 300	\$ 300	\$ 300	\$ 300
Electrical power board	\$ 100	\$ 100	\$ 0	\$ 0
Hot air rework station	\$ 190	\$ 190	\$ 190	\$ 190
Odroid	\$ 140	\$ 140	\$ 140	\$ 0
Monitor	\$ 180	\$ 180	\$ 0	\$ 0
Oscilloscope	\$ 700	\$ 0	\$ 0	\$ 0
Bench Clamp	\$ 150	\$ 150	\$ 150	\$ 150
<b>Total</b>	<b>\$ 2,035</b>	<b>\$ 1,335</b>	<b>\$ 980</b>	<b>\$ 640</b>

## Watonomous Proposal Report

*Aditya Sharma*

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### Description of Proposal

In April 2017, WATonomous was selected to represent the University of Waterloo as one of eight universities, and one of two Canadian Universities to participate in the three-year SAE AutoDrive Challenge. The goal of WATonomous, and the SAE AutoDrive Challenge, is to transform a stock Chevrolet Bolt EV into a fully autonomous vehicle.

This arduous, multi-disciplinary challenge needs a high amount of dedicated, hardworking and talented people from all domains of engineering, mathematics, arts and science faculties. It turns out that University of Waterloo is just the place look for people that meet these criteria. This term alone, over 200 students showed interest in the organization, and approximately 140 high achieving individuals were chosen to join the team making WATonomous one of the largest student design teams in the University of Waterloo's Sedra Student Design Centre. Considering the diverse skills required to create a fully autonomous vehicle, we have recruited 110 engineers from all disciplines, along with 24 Fourth Year Design Project students. Creating an autonomous vehicles relies heavily on software and mathematical concepts like critical thinking, path-planning, problem-solving, computer vision, probabilistic analysis and machine learning just to name a few. With the knowledge of these ideas, our members from the faculty of engineering are crucial in reaching our goal. WATonomous provides a platform for engineering students to apply their knowledge from the classroom to a full-fledged project. By competing in the SAE AutoDrive Challenge and gaining experience with hands-on work utilizing industry-grade software from the cutting-edge field of autonomous vehicles, students gain a unique opportunity that is not available anywhere else on campus.

Funding from WEEF will help fulfill the high level of needs for the large volume of students that are engaged in the team and help advance our cause.

### Proposal Benefits

WATonomous will offer Sponsorship benefits for WEEF if requested funding is provided partially or in full. WATonomous is greatly thankful for your previous contributions. To show our appreciation, the following benefits will accumulate together with previous terms of funding approvals:

Diamond (\$20,000+) - Signed team picture - Tour of WATonomous - Having your staff advise our subteams - Large sized business logo: promotional print on material and yearly banner - Invitation to in-person demo in March 2020 (near final product) - Large sized business logo on vehicle - Recruitment: send job postings directly to our team of students - Access to the resumes of WATonomous students - Cross promotional video to be posted on Social Media and Website (and will also provide to sponsors)

Platinum (\$10,000 - \$20,000)

- Signed team picture
- Tour of WATonomous
- Having your staff advise our subteams
- Medium sized business logo: promotional print on material and yearly banner
- Invitation to in-person demo in March 2020 (near final product)
- Standard sized business logo on vehicle



- Recruitment: send job postings directly to our team of students
- Gold (\$5,000 - \$10,000)
- Signed team picture
  - Tour of WATonomous
  - Having your staff advise our subteams
  - Standard sized business logo: promotional print on material and yearly banner
- Silver (\$1,000 - \$5,000)
- Signed team picture
  - Tour of WATonomous
  - Having your staff advise our sub-teams
- Bronze (\$500 - \$1,000)
- Signed team picture

### **Estimated Equipment Lifetime**

The equipments that WATonomous is asking for will last at least five years and therefore is definitely a long term investment. Some of these materials would also be highly desirable to other student design teams, and thus, could be donated to them if there is no successor competition. All in all, they are all a very solid investment which will provide a huge return on investment to various groups and teams on campus and just make the Waterloo campus more accessible, vibrant and well-equipped for innovation.

### **Implementation Schedule**

Equipment is to be purchased in the Spring 2018 term to use for Year 2 challenge requirements.

### **Additional Information**

More information about the equipments that WATonomous is requesting funding for:

The Blackfly cameras serve a key role in allowing the car to detect and classify objects in a 2D image frame, and acts as the eyes of the car. When adding another one of these cameras in another location, we can stitch data from the two together to extract some 3D data. However, this 3D data is not very rich, hence the need for our Velodyne VLP-16 LiDAR.

The VLP-16 LIDAR sensor allows the car to receive spatial data of its environment, in 3 dimensions. In addition, by pairing the LiDAR with the cameras, very useful data can be extracted. For example, in the nighttime, the Blackfly cameras will not capture any meaningful data with a special lens, but the VLP-16 will be able to. Another benefit of having both is that cameras are much better for extracting data features, and the VLP-16 is better for identifying object geometry. There are many more scenarios which the self-driving system benefits from having both of the sensor types.

WATonomous will be ever so thankful for the help of WEEF and really make sure that all the funds are used in the spirit of engineering: to create and innovate for the betterment of the society. Working on such a project requires the whole community to come together and brings us closer to serve a singular purpose.



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Blackfly 2.3 MP Mono GigE PoE Camera (high speed)	\$ 1500	\$ 0	\$ 0	\$ 0
Blackfly 5.0 MP Color PoE Camera for Machinevision	\$ 1500	\$ 0	\$ 0	\$ 0
LIDAR SENSOR for Object Detection	\$ 8000	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 11,000</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Industry 4.0 Design Team

S18-1301



## Industry 4.0 Design Team WEEF Sponsorship Proposal

*Fadel Haider Nasereddin*

*Business Lead- Sponsorship, Industry 4.0 Design Team*

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### Description of Proposal

The University of Waterloo Industry 4.0 design team is focused on promoting the unique Management Engineering program offered here at the University. Our team designs and organizes an "industry 4.0"-themed competition for high school students across the country to participate in. We also work with a custom scale factory that we model the competition after. This proposal is for the factory equipment. The factory will help give a better sense of what the competition is based off of. We are looking to expand to include other engineering disciplines as well, so the factory is essential to this as it would attract the attention of Mechatronics Engineering, Software Engineering, etc.

### Proposal Benefits

- The competition could change every year for a more interesting competition, which would attract the attention of prospective students.
- It would bring attention to Management Engineering, which is a growing but little known part of the engineering faculty.
- The model factory would be a great learning tool for the members of the Industry 4.0 team.
- It could help attract the attention of other engineering disciplines who could learn MSCI concepts that would be applicable to their future co-ops and careers. o We could expand the Industry team beyond the Management family to cater to the interest of Mechanical and Mechatronics students (through the design and building stages of our factory) and the Software engineering disciple (for the coding and software aspects of running the factory, developing the website and maintaining the online competition platform)
- It would allow students in other disciplines who are taking the MSCI option of their degree to apply their knowledge of management sciences and see physical applications.
- WEEF has already funded parts of the MSCI lab in CPH now, so this is a continuation of funding that will have a greater impact on all disciplines of engineering students Companies or individuals considering sponsoring Industry 4.0 would have an impressive tangible model to look at.

### Estimated Equipment Lifetime

5 years - (approximation)

### Implementation Schedule

If funding is granted, purchase will be done by the end of Spring 2018. Build up of the simulated manufacturing line will be done in Fall 2018 and first test is scheduled on Spring 2019.

August 2018 - contact merchandise September 2018 - purchase and shipping November - December. 2018 - assembly into manufacturing line June. 2019 - able to be used

### Additional Information

Option 1 is ideal jump-start, Option 2 is the minimum requirements to start building a proper factory and avoid delays Option 3 & 4 are not enough alone to start building a factory, thus will cause delays by at least a semester.

\*\*All factory equipment are from the same company - fischertechnik



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
3-D Robot	\$ 1561	\$ 1561	\$ 1561	\$ 0
Punching Machine with Conveyor Belt	\$ 801	\$ 801	\$ 0	\$ 0
Conveyor Belt	\$ 710	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 3,072</b>	<b>\$ 2,362</b>	<b>\$ 1,561</b>	<b>\$ 0</b>

# Esperto Labs

S18-1287

## Esperto Labs - S18

*Daniel De Sousa*

*Team Lead, Esperto Labs*

*dde Sousa@uwaterloo.ca*



### Description of Proposal

Esperto Labs is a new student design team whose first goal is to design a new open-source smart watch from the ground up.

Our vision is to design a wearable platform simple enough for beginners to learn, yet powerful enough for professionals and researchers to use in their work.

Our platform enables users to implement their own hardware and software, making it fully customizable to any application of their liking. This removes the tedious task of creating wearables from scratch to test sensors or obtain necessary biometric data. Our device also has an accompanying mobile and web application which receives data from the watch and sends notifications. The applications are also fully modifiable by the developer and can be used to monitor and further process data.

On this team, students are able to work independently or cooperatively on a feature of the watch such as wireless communication or heart rate data collection, come together at the end of the week and show it off to the rest of their teammates. If approved, their feature will be implemented into the next iteration of the Esperto Watch.

The Esperto Labs team is currently working on the third version of the watch, the companion mobile and web applications, and a developers watch and charging stand. The team is asking WEEF for funding pertaining to purchasing additional circuit boards and mechanical prints.

### Proposal Benefits

Unlike many traditional design teams, students on the Esperto team are given the opportunity to not only choose what they get to work on, but actually develop and take ownership of the feature they have worked on. Students are able to use the knowledge they learned in previous courses and work terms, but also explore new avenues and skills in concepts which they had never worked with before.

The team is asking WEEF for sponsorship to be able to continue their hard work on the next iterations of the watch. Furthermore, funding from WEEF will result in more prototypes being readily available for students to work on. Funding would allow our team leads to pursue and recruit more Engineering students and continue to design new revisions of the watch, including features such as GPS and Wi-Fi.

### Estimated Equipment Lifetime

The printed circuit boards and 3D prints will be used until the next official versions are printed (approximately a year).

The boards will continue to be used for prototyping and showcasing after this time period.

### Implementation Schedule

All components will be purchased immediately to allow team members to begin using them right away!



**Additional Information**

None

**Cost Breakdown**

<b>Item</b>	<b>Option1</b>	<b>Option2</b>	<b>Option3</b>	<b>Option4</b>
Watch PCB	\$ 600	\$ 300	\$ 300	\$ 0
Watch Case (Mechanical)	\$ 100	\$ 50	\$ 0	\$ 0
Charging Stand PCB	\$ 300	\$ 150	\$ 150	\$ 0
Watch Stand (Mechanical)	\$ 140	\$ 70	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,140</b>	<b>\$ 570</b>	<b>\$ 450</b>	<b>\$ 0</b>



## Iron Warrior Archive Storage Request

Syed Hasan Ahmed  
Editor-In-Chief, Iron Warrior  
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### Description of Proposal

We are asking for 1 or 2 64/128 USB Sticks to store the information from the previous years on the computer. Currently we have storage on floppy disks. We only have 8GB left on our computer out of ~240 GB, which is very low for the newspaper. Option 1 is for 2x 128GB USBs, Option 2 is for 1x 128GB USB, Option 3 is for 2x 64GB USBs, Option 4 is for 1x 64GB USBs

### Proposal Benefits

Benefits include longer computer life, storage of past information, and easy use as opposed to our current floppy disks. We have many floppy disks that I don't even think can be read by our current computer. They're 1-2MB each.

### Estimated Equipment Lifetime

Forever, or at least until USBs phase out.

### Implementation Schedule

Immediately, hopefully before the Fall 2018 Editor-In-Chief begins.

### Additional Information

We have been running a deficit for few years so we cannot afford this out of our own EngSoc budget.

Any brand is fine so long as it works. USB 3.0s are preferred just because they are newer and won't be phased out as early as 2.0, but we don't mind too much since anything archived that far back will most likely not be used by the time 2.0 is obsolete. And it's just an archive; it's not like we'll be using the USBs very often.

I'm willing to buy a little cheap, so the options listed are on the higher end of prices I could find of those USB sizes (so they include 3.0s). Option 2 and 3 are the same price as a result, but Option 2 is preferred over 3 since it's easier to keep track of 1 USB than 2.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
USB(s)	\$ 100	\$ 50	\$ 50	\$ 25
<b>Total</b>	<b>\$ 100</b>	<b>\$ 50</b>	<b>\$ 50</b>	<b>\$ 25</b>

## WatLock Radiation Prevention Fabric Funding

*Alex Kai Wei*

*Business Member, WatLock*

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### Description of Proposal

WatLock is a student design team that started in March of 2018 and has now over 40 members from a variety of engineering and science programs. Our goal is to design and prototype an airlock utilizing various principles and skills from engineering and laboratory research. Our team will be competing in University of British Columbia's Mars Colony Project Airlock Challenge held in May 2019 for airlock design and May 2020 for airlock prototyping.

We would like to ask that you assist our research team in its projects by funding necessary chemicals, totaling at \$96.44. Our team is currently testing flexible fabric that will protect our airlock from harmful radiation. The considered fabrics are nomex (a material that is lighter and more flexible in structure to Kevlar) and Kevlar itself. We also accept partial funding.

### Proposal Benefits

WatLock is an undergraduate student design team focused on learning and exploring the mysteries on the world around us. We provide the engineering community with the opportunity to tackle various issues with space engineering as well as the hands on research opportunities to test various materials and designs to be used in space. Our team consists of a variety of programs including:

- Nanotechnology Engineering
- Electrical and Computer Engineering
- Chemical Engineering
- Mechatronics Engineering
- Mechanical Engineering
- Management Engineering
- Physics Honours

Through WEEF's sponsorship, WEEF will have exposure on our team apparel, which is worn in community events and at the competition in the University of British Columbia, on our website, posters, banners and potentially on the airlock itself.

### Estimated Equipment Lifetime

The fabric will last indefinitely or until the tested material is scrapped from the design.

### Implementation Schedule

The fabrics will be ordered as soon as possible to ensure the immediate testing of these fabrics

### Additional Information

As a first time sponsor, we would hope to be able to build a strong relationship to further WEEF's influence in engineering and technology as well as training future engineers to build their interest in the areas of materials, mechanical, electrical research and design.



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Meta-Aramid Felt (Similar to Nomex®)	\$ 53	\$ 53	\$ 0	\$ 0
Kevlar Felt Skid Plates	\$ 44	\$ 0	\$ 44	\$ 0
<b>Total</b>	<b>\$ 97</b>	<b>\$ 53</b>	<b>\$ 44</b>	<b>\$ 0</b>

## WEEF WatFly Proposal

*Abinesh Chandrasekhar*  
*Technical Lead, WatFly*  
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### Description of Proposal

WatFly is University of Waterloo's new design team focused on winning Boeing's GoFly Competition while gaining valuable experience working as a team of individuals with different skill sets. Our goal is to advance transportation into personal urban flight, this means developing, building and testing a single occupant pod that is capable of flight. As an intermediate step, we are currently working on building a prototype to validate our controls and aerodynamics models.

WatFly is asking for sponsorship for the cost of prototyping a 1:4 scale of our VTOL air vehicle, a battery tester for testing battery cells, and full scale custom design propellers for the flight.

The estimated cost for the prototype comes out to be \$1970. The propellers cost \$1520 and the off the shelf battery tester will be approximately \$1209.

### Proposal Benefits

Watfly is at a phase where any resource investment will kick-start progress, as a result WEEF's funding is crucial. The prototype (airframe, and electronics) is equipped for us to be able to validate our theoretical design of the full scale pod. This validation not only helps us gain technical knowledge in fields such as control theory, finite element methods, and aerodynamics but also allows us to gain priceless soft skills such as project management, team development, technical report prep etc. Through manufacturing the required parts the students involved are exposed to a multitude of fabrication techniques ranging from fiberglass composite manufacturing to manually soldering microelectromechanical systems (MEMS) chips onto PCBs.

The battery tester will allow us to develop battery cell characteristics such as voltage vs capacity for modelling and simulating battery pack behaviour for a given flight mission. Developing an efficient and optimized electrical power source is key to maximizing range. The tester allows us to do this by customizing and selecting the best available battery cell in the market for our needs. The electrical energy storage industry is exponentially growing and in need of knowledgeable cell designers to advance.

Other than the battery pack, the next most critical component is the propeller. Propellers are needed to validate twelve months of concept iteration. Not only do they need to fulfil the requirement of lifting the weight of the craft, they need to do so while meeting the competition's strict noise and size constraints. As a result, our team is forced to optimize the propeller for aerodynamic, acoustic and structural performance while making it as light as possible. The true innovation we hope to achieve is fabricate a composite aero elastic propeller that can maintain a high efficiency in low and high speed flight without complex actuation. The cost requested is indicative of custom propellers.

After the completion of our competition all the equipment can be used by the faculty of engineering in a variety of ways. The drone itself is a solid test platform for testing controls and flight dynamics algorithms for post grads and even undergrads. The tester and power electronics can even be held by MESS or incorporated into courses for further student learning. There are also multiple other student teams (Warg, Formula Electric/Combustion, Robotics etc.) that can make use



of common components such as motors, speed controllers, flight computer etc.

### Estimated Equipment Lifetime

- 3 years - Drone
- 5+ years - Battery Tester
- 3 years propeller

### Implementation Schedule

WatFly is currently contacting several companies to purchase parts for the prototype.

### Additional Information

WatFly has reached out to MEF and Engsoc for funding support. Our estimates on funding we expect to receive from each of the organizations is approximately \$1000. WEEF is our primary source of sponsorship, thus, to acknowledge funding from WEEF, we have quite a few marketing surfaces where we'd display WEEF's logos. Our main products are prototype drones and a full size pod, both of which can display the WEEF logo. In addition, we would also be able to display the WEEF logo on our T-shirts and other custom gear. Our website can also show the WEEF logo, along with advertising engineering members. From a social media stand point we'd be able to make a post for WEEF.

Website: <https://www.watfly.ca/>

Facebook: <https://www.facebook.com/WatFly/>

Twitter: [https://twitter.com/Wat\\_Fly](https://twitter.com/Wat_Fly)

Instagram: [https://www.instagram.com/wat\\_fly/](https://www.instagram.com/wat_fly/)

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Prototype Airframe	\$ 1320	\$ 1320	\$ 1320	\$ 1320
Prototype Electronics	\$ 650	\$ 650	\$ 650	\$ 650
Main Propellors	\$ 1520	\$ 1520	\$ 0	\$ 0
Battery Tester	\$ 1209	\$ 0	\$ 1209	\$ 0
<b>Total</b>	<b>\$ 4,699</b>	<b>\$ 3,490</b>	<b>\$ 3,179</b>	<b>\$ 1,970</b>

# UW Warrior Home Design Team

S18-1329



## Warrior Home Design Team Funding Request

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*Senior Project Manager, UW Warrior Home Design Team*

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### Description of Proposal

The University of Waterloo Warrior Home is an undergraduate engineering design team made up of members from a variety of engineering programs. Our team is only a year in the making and we aim to combine philanthropic opportunities with real hands-on design experience, with the goal to design an energy efficient, cost-effective home. We compete in the annual Race-to-Zero Competition in Golden, Colorado, which is hosted by the U.S. Department of Energy.

We are also developing a shed design which we will build each year to raise awareness for our purpose to facilitate affordable housing. The finished shed from the Shed Build event, will be sold within the community and the money will go to Habitat for Humanity Waterloo Region. We also plan to develop construction programs and workshops that teach students do-it-yourself construction projects. Throughout the each school term we conduct numerous campus fundraisers to further collect funds for Habitat for Humanity, as well as spread awareness about them.

Therefore, we are requesting financial support to purchase specific softwares that are used frequently by our team, to install on a shared computer within the E5 Design Team Student Offices. These include the Adobe Suite with products such Illustrator, InDesign and Photoshop as well as Sketch-Up Pro. All of these programs are imperative to complete our deliverables for the Race to Zero competition. For our Shed Build event we are requesting support to purchase paint brushes, hard hats, safety goggles, and working gloves as safety is our main priority when hosting an event that involves construction. Lastly, to promote success within our team we looking to purchase a projector for our meetings and a speaker for our on campus events.

### Proposal Benefits

The Waterloo Warrior Home Design Team provides an excellent educational background for undergraduate students interested in home design and energy conservation. From custom-designed houses with special environmental considerations, to building the houses at community build days, and taking part in the financial considerations of urban planning, the Warrior Home provides its members with complete exposure to everything it takes to complete a residential house in the Kitchener-Waterloo Community.

The most direct benefit of the proposed tools is providing engineering students the opportunity to gain hands-on experience even before their first work-term begins. Experience using softwares that are not traditionally taught in engineering curriculum are valuable skills that we provide to our members. By hosting education based meetings about all aspects of energy efficient home design, we are providing students with tools to apply in the workplace and in their own life. Currently the club is made up of 11/14 Engineering disciplines. Students from the Faculty of Engineering make up 90% of the general body and 95% of team leads.

Furthermore, WEEF will be eligible to receive our "Foundation Layer" sponsorship tier. The benefits would include the WEEF logo on the website, t-shirts, newsletter, and banners, a termly update newsletter, and an appreciation certificate.

### Estimated Equipment Lifetime

The software is purchased by a yearly or monthly subscription. This purchase of this subscription will be re-evaluated by the



team on a yearly basis to ensure that it is only purchased if it continues to benefit the team. The safety equipment, speakers and projector are expected to last 5 years. The paint brushes for the Shed Build event are expected to last 1-2 years.

**Implementation Schedule**

All items will be purchased once funding is received, as they are all critical to the success of the team and the shed build event.

**Additional Information**

None.

**Cost Breakdown**

Item	Option1	Option2	Option3	Option4
Adobe Suite	\$ 330	\$ 330	\$ 0	\$ 0
SketchUp Pro	\$ 170	\$ 170	\$ 0	\$ 0
Portable Speaker	\$ 100	\$ 0	\$ 0	\$ 100
Portable Projector	\$ 200	\$ 0	\$ 0	\$ 200
Hard Hats (8)	\$ 150	\$ 0	\$ 150	\$ 0
Working Gloves (8)	\$ 70	\$ 0	\$ 70	\$ 0
Safety Goggles (22)	\$ 100	\$ 0	\$ 100	\$ 0
Paint Brushes (15)	\$ 25	\$ 0	\$ 25	\$ 0
<b>Total</b>	<b>\$ 1,145</b>	<b>\$ 500</b>	<b>\$ 345</b>	<b>\$ 300</b>

## UWaterloo IISE WEEF Sponsorship Proposal

*Ghazal Malekanian*

*Director of Finance, UWaterloo IISE*

*gmalekanian@uwaterloo.ca*

### **Description of Proposal**

The Institute of Industrial and Systems Engineers, IISE, the world's largest professional society dedicated solely to the support of the profession, is an international, nonprofit association that provides leadership for the application, education, training, research, and development of industrial and systems engineering. The purpose of this organization is to provide knowledge, training, and networking opportunities that inspire students to become technically and socially competent Management and Systems Engineers. Specifically, our chapter strives to provide avenues for growth academically, professionally, and socially through unique events and services.

Currently we provide a services such as resume critique and run events and workshops to allow students to develop their skills. We have just launched IISE Spotlights, which are blog posts on interviewing Management Engineering students and shining light on their amazing academic and professional experiences. Most importantly, the UWaterloo IISE team works extremely hard every year to organize and provide funding to give students the chance to attend the IISE Annual Regional Conference. This conference is an incredible opportunity for students to participate in exciting and challenging competitions while attending workshops to learn from industry professionals.

Students will have to contribute financially to attend the conference, but our team is determined to lighten that load off their shoulders in order for them focus on the experience. We sincerely appreciate the Waterloo Engineering Endowment Fund in providing us with any funding for the items mentioned below in this proposal.

### **Proposal Benefits**

The IISE Waterloo Chapter provides the opportunity for all engineering students to apply and participate in the conference as delegates. Considering the Industrial Engineering focus in the conference, the majority of the attendees are part of Management, Systems, and Mechanical Engineering.

Throughout the years we have been able to successfully branch out to other engineering programs and make all students aware of all that the chapter offers to them. Management Engineering students do have the strongest presence at 45% due to the nature of the team. However, we are glad to have a wide spread of students interested in our services and currently a part of our mailing list: 19% Systems Design, 12% Mechanical, 6% Software, 4% Electrical & Computer, 3% Civil, and 3% Chemical. As the chapter grows and moves forward we hope encourage more students from different disciplines to participate in the conferences and be a part of the IISE family.

The past year has been an extremely successful one for the UWaterloo IISE student chapter. Most notably, we were selected to present at the 2017 IISE Annual Conference & Expo down in Pittsburgh, Pennsylvania in front of all the other student chapters. We spoke about the best practices we utilize and how other chapters can implement them into their teams.

Participating in these events is a great opportunity for students to represent Waterloo on the international stage and we are extremely proud.

Over the years, the IISE Annual Regional Conference has been a great experience for all delegates and competitors that have attended. The three-day event is filled with activities and events where students learn from professionals and have the opportunity to participate in competitions that not only challenge them but also requires them to draw from their academic knowledge and work-term experiences in order to succeed.

With the help of of our partners and sponsors we hope to reach more students every year and make the chance to join next



year's Regional Conference a possibility for everyone.

### Estimated Equipment Lifetime

The conference supplies will be used by our delegates and competitors during the conference in Winter 2019.

The 3D printed keychains and banner will be used during the Student Showcase happening at the start of the upcoming Fall term. Keychains will be given out to students during the event and the banner will be used in all other future events.

Any remaining supplies will be used for the following year's conference or future events.

### Implementation Schedule

All expenses relating to the conference (conference fees and supplies) will be purchased closer to the conference date in January.

All other items will be purchased in Fall 2018.

### Additional Information

Conference Fees:

Quantity: 40 (students)

Price per item: \$350

Conference T-shirts:

Quantity: 40

Price per item: \$9.74

IISE Banner:

Quantity: 1

Price per item: \$100

Keychains:

Quantity: 50

Price per item: \$9 /inch<sup>3</sup>

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Conference Fees	\$ 7000	\$ 5250	\$ 3500	\$ 0
Conference t-shirts, opening ceremony supplies	\$ 400	\$ 300	\$ 200	\$ 0
IISE Banner	\$ 100	\$ 100	\$ 100	\$ 0
3D printed (or laser cut) IISE keychains	\$ 450	\$ 250	\$ 150	\$ 0
<b>Total</b>	<b>\$ 7,950</b>	<b>\$ 5,900</b>	<b>\$ 3,950</b>	<b>\$ 0</b>

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Page	Proposal ID	Title	Requested
<b>Faculty Proposals</b>			
2	WP-1304	AFM for Nano Engineering Undergraduate Laboratory	\$ 20,000
3	WP-1306	Potentiostat for Electrical Impedance Spectroscopy	\$ 20,655
4	WP-1290	Soils Mixer	\$ 1,905
5	WP-1291	Laboratory Balance	\$ 3,150
6	WP-1331	YSI Rhodamine Probe	\$ 5,364
7	WP-1325	Development of New Ankle Foot Orthoses	\$ 500
8	WP-1347	Proposal 1: 3d Printers at UWSA	\$ 2,550
9	WP-1348	Proposal 2: Oculus Rift for UWSA	\$ 699
10	WP-1349	Proposal 3: 3D Printers and VR for UWSA	\$ 3,249
11	WP-1305	MA-8005 Manipulators (DC Probes) for Nano Undergra	\$ 30,000
12	WP-1313	Tools and Equipment for Engineering 7 Project Shop	\$ 24,000
14	WP-1339	Table Frames and Chairs for SYDE classrooms	\$ 13,100
15	WP-1330	E2 Foyer furnishings	\$ 4,000
16	WP-1298	Hardware for Nano Engineering Days	\$ 2,500
17	WP-1299	Equipment for Digital Ideas Clinic	\$ 20,000
<b>Total</b>			<b>\$ 151,672</b>
<b>Miscellaneous Proposals</b>			
18	WP-1297	Turning O-week into O-strong	\$ 36,062
19	WP-1309	Alternative Bench Press FYDP	\$ 300
20	WP-1308	TEDxUW 2018 Conference	\$ 1,960
<b>Total</b>			<b>\$ 38,322</b>
<b>Student Proposals</b>			
25	WP-1326	UW Baja SAE Spring 2018 Funding Request	\$ 4,070
27	WP-1337	Midnight Sun New Motors	\$ 4,000
28	WP-1323	UW Nanorobotics Team Funding Proposal	\$ 602
30	WP-1314	Dynamic Spoiler Parts Funding	\$ 70
31	WP-1317	University of Waterloo Robotics Team Mars Rover	\$ 2,000
33	WP-1318	UW Robotics Team Reallocation Proposal	\$ 271
35	WP-1333	Waterloo Rocketry - S18 Proposal	\$ 4,600
38	WP-1342	Waterloo Aerial Robotics Group S18 Proposal	\$ 2,500
40	WP-1341	UWFM Engine	\$ 1,356
41	WP-1343	Vacuum Thermoformer	\$ 2,680
43	WP-1336	Waterloo Formula Electric S18 Tools	\$ 9,600
45	WP-1340	iGEM 2018 WEEF Funding Proposal	\$ 600



47	WP-1335	University of Waterloo Finance Association	\$ 1,000
49	WP-1322	UW Concrete Team - WEEF Proposal S18	\$ 164
50	WP-1310	Spring 2018 UW Steel Bridge Team Sponsorship	\$ 954
52	WP-1332	Waterloo Submarine Racing Team Proposal (W2018)	\$ 820
54	WP-1350	Hack The 6ix Proposal	\$ 1,500
56	WP-1319	UW Sailbot Spring 2018	\$ 2,035
59	WP-1338	Watonomous Proposal Report	\$ 11,000
62	WP-1301	Industry 4.0 Design Team WEEF Sponsorship Proposal	\$ 3,072
64	WP-1287	Esperto Labs - S18	\$ 1,140
66	WP-1294	Iron Warrior Archive Storage Request	\$ 100
67	WP-1307	WatLock Radiation Prevention Fabric Funding	\$ 97
69	WP-1344	WEEF WatFly Proposal	\$ 4,699
71	WP-1329	Warrior Home Design Team Funding Request	\$ 1,145
73	WP-1334	UWaterloo IISE WEEF Sponsorship Proposal	\$ 7,950
<b>Total</b>			<b>\$ 68,025</b>