



UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

DEEP Summer Academy 2015

Request for Proposals

Deadline: November 30th 2014

Primary Contact: DEEP Coordinator

Engineering Outreach Office

University of Toronto

deep@engineeringoutreach.com

Request for Proposals: DEEP Summer Academy 2015

About the Engineering Outreach Office

The Engineering Outreach Office, manages and administers the core outreach programs offered by the Faculty of Applied Science & Engineering at the University of Toronto. We act as the central unit for outreach activities promoting Science, Technology, Engineering and Math (STEM) education to a wide audience.

The Engineering Outreach Office is dedicated to contributing to the development and education of the participants in our pre-university programs and the undergraduate and graduate students who provide instruction and support to them. We strive to ensure that the Faculty of Applied Science & Engineering at the University of Toronto prepares both high school students, as well as undergraduate and graduate students, to be engaged global citizens who see the impact of their action.

For more information about the Engineering Outreach Office, visit:

<http://outreach.engineering.utoronto.ca/aboutus.htm>

Overview of DEEP Summer Academy

The Engineering Outreach Office will be accepting course proposals from **Oct 15th - Nov 30th, 2014** for the 2015 session of the Da Vinci Engineering Enrichment Program (DEEP) Summer Academy, which takes place from July 6 - 31st, 2015.

DEEP provides well-rounded and highly motivated high school students from across Canada and around the world with the opportunity for advanced study in a variety of engineering, science, technology and business disciplines. This program has been designed to expose bright young minds who have an aptitude for math and science to concepts beyond the regular secondary school curriculum. The majority of DEEP courses are one week in length (Monday to Friday) and are offered at either Junior (Grades 9 and 10) or Senior (Grades 11 and 12) levels. Select courses will be offered to all grade levels.

For more information about DEEP Summer Academy, please visit our website:

<http://www.deepsummeracademy.com>

Instructor Requirements

To provide DEEP students with a unique and challenging learning experience during the program, it is preferred that all instructors are currently in pursuit of either a Masters or PhD degree at the University of Toronto and have previous teaching experience. Instructors of this calibre serve as an inspiration for high school students while providing them with a taste of the university experience. Instructors generally come from the Faculty of Applied Science & Engineering at the University of Toronto; however, previous instructors have also come from other professional faculties including the Faculty of Pharmacy and the Faculty of Medicine. The Engineering Outreach Office also welcomes proposal submissions from recent alumni.

Please note the following:

- i. If an offer of employment is extended, it will be conditional upon the submission of a police records check clearance letter and proof of WHMIS certification, and attending all mandatory training.
- ii. With very few exceptions, the Engineering Outreach Office will not be accepting course proposals from instructors who wish to co-teach a course. If you wish to co-teach a course, your cover letters must clearly state what each applicant brings to the table and how co-instructing would be a value add for the students in your class. Please contact the DEEP Coordinator, at deep@engineeringoutreach.com if you have any questions or concerns.

- iii. Returning instructors must ensure that proposal submissions have been updated to reflect current research in their field and include revised curriculum and/or activities that speak to lessons learned from previous years. Submissions that have not been revised and updated will not be considered. Note: This RFP document has been updated. Please ensure you meet all the updated requirements for the 2015 DEEP RFP.

Proposal Submission Details

There are 5 parts to this Request for Proposal (RFP):

- PART I: Cover letter, résumé and references
- PART II: Application form
- PART III: Course proposal
- PART IV: Instructor biography
- PART V: Summary of relevant experience

Completed proposals (*please see page 5 for a checklist of required items*) are to be submitted to the DEEP Coordinator, no later than **Midnight on Sunday, November 30th, 2014.**

There are 2 ways to submit your proposal:

1. *Email:* deep@engineeringoutreach.com [**preferred**]
2. *In Person to:* 35 St. George Street – The Galbraith Building - Rm. 173 (The Engineering Welcome Centre).

N.B: If you choose to submit a hard copy of your proposal, you must also submit an electronic copy via email to: deep@engineeringoutreach.com.

Competitive applicants will be contacted to schedule an interview starting **Nov 17, 2014.** Conditional offers of employment will be extended to successful candidates via email shortly thereafter. Please see the last page of this document for important dates in the 2015 DEEP RFP process.

Part I: Cover Letter, Résumé and References

Please attach a cover letter, résumé and contact information for three references. Ideally, these references should be able to speak to your ability to convey complex information in an instructional setting and your ability to showcase your research while making it relevant to youth.

It is preferred that one of your references is your graduate studies supervisor. If you have a graduate studies supervisor, the Engineering Outreach Office strongly encourages you to discuss your interest in teaching DEEP with them and to let them know that you will be out of your lab or office during business hours for the week(s) that you are teaching.

Part II: Application Form

Personal Information

Please select: Dr. Mr. Ms.

Surname _____

Given Name _____

Email Address _____

Home Address _____

Country _____

City _____

Province/State _____

Postal/Zip Code _____

Phone (Day) _____

Phone (Evening) _____

Have you taught DEEP before? Yes No

If so, when and for how many years? _____

Have you attended any programs run by the Engineering Outreach office? Yes No

If so, what program did you attend (ex. Jr. DEEP, DEEP etc.)? _____

How did you hear about the DEEP RFP? _____

Educational Background (if applicable, use an asterisk to denote current information)

Institution & Faculty	Program & Department	Degree, Certification or Designation	Year Completed or Expected

(Candidates in pursuit of graduate studies in Engineering at the University of Toronto preferred)

Are you:

- An alumnus/alumna
- Pursuing a PhD degree
- Pursuing a Masters degree
- Pursuing an undergraduate degree

Other _____

Eligibility for Employment

You are a: Canadian Citizen Landed Immigrant Visa Student

If you are a visa student, do you have a permit to work in Canada?

- Yes No

Availability for Employment

Please check all that apply:

- Week 1: July 6-10, 2015
- Week 2: July 13-17, 2015
- Week 3: July 20-24, 2015
- Week 4: July 27-31, 2015
- Available for additional opportunities in May, June and/or August, 2015

Additional Information

Please note that offers of employment are conditional upon instructors attending training, submitting a police records check clearance letter and proof of WHMIS certification.

I hereby certify that the information on all material that I am submitting is complete and accurate to the best of my knowledge and I authorize the Engineering Student Outreach Office to make such inquiries as may be deemed necessary in the processing of my application for employment. It is understood and agreed that any misrepresentation made by me in connection with these materials may be sufficient cause for cancellation of this application or, if I have been employed, cause for dismissal.

Applicant Signature _____

Date _____

Request For Proposal Checklist

Please make sure you have attached:

- Your cover letter, resume and contact information for three references.
- Your completed Application Form (pages 3-5)
- Your course proposal, description and outline
- Your instructor biography, written in the third person
- A separate page describing your relevant employment experience and reason for applying

Part III: Course Proposal

DEEP aims to develop and offer courses that are intellectually challenging, engaging and serve to encourage interest in the various Engineering disciplines offered by the Faculty of Applied Science & Engineering at the University of Toronto. Again, please note that with very few exceptions, the Engineering Outreach Office will not be accepting course proposals from instructors who wish to co-teach a course. Please contact the DEEP Coordinator, at deep@engineeringoutreach.com if you have any questions or concerns.

In this section, you will provide detailed information about the course/courses you would like to teach as part of DEEP Summer Academy. If your course proposal is selected, information from this section will be used in promotional materials. Please note that there will be an opportunity to edit/update any of this information prior to publication if necessary.

Starting on page 9 is a sample outline for a proposed course called “Great Challenges in Neuroscience” which has been developed for the Senior level (grade 11 and 12 students) of DEEP. The course outline is in chart format and specifies the themes, topics, activities and learning goals for 5 days of educational programming.

Using an identical chart format, (pages 9 & 10) attach your own proposal for 5 days of educational programming for each course you would like considered. Be sure to include the course title, grade level, stream and description for the course(s) you are submitting. Note that the sample 5-day course outline below has sections for you to provide details about the types of hands-on activities you plan to facilitate, the materials you require, etc. If your course proposal is accepted, you will be asked for additional information regarding the specifics of what you require to effectively deliver your course(s) – facilities, materials, a.v. equipment, etc. Note: If you require any highly specialized space or equipment it is the responsibility of the instructor to help arrange the use of it. Eg. SEM, 3D Printer or Specialized Lab.

Every DEEP course is assigned 2 to 5 undergraduate counselors depending on course need. Please indicate in your proposal how you will engage these counselors while teaching at DEEP. The goal of our office is to provide both an enriching experience for the students attending DEEP and all those working and teaching in the DEEP classrooms.

DEEP Summer Academy is committed to showcasing innovative research that is currently being conducted at the University of Toronto and demonstrating how it is being applied to solve real world problems.

In your course proposal, be sure to indicate how you might integrate or showcase either your own research or a research project (past or present) from another researcher at the University of Toronto into your course. Also, please explain how the content you cover each day is being applied/may be applied to solve real world problems.

Proposed Stream Descriptions

DEEP is very interested in courses that encourage interest in the various Engineering disciplines offered by the Faculty of Applied Science & Engineering at the University of Toronto. If you are uncertain of where your proposed course(s) should sit, please refer to the University of Toronto Engineering undergraduate disciplines as a starting point. <http://www.engineering.utoronto.ca>

The following is a list of “*academic streams*” that may be offered as part of DEEP 2015. Streams may be offered at either the Junior or Senior level and select streams will be offered at both levels. Each stream is composed of three courses and serves to provide students with a solid, foundational body of knowledge. In the final week of the program, “Design & Innovation Week,” students are required to use that knowledge to complete major design projects.

These streams and course titles serve as examples and are meant to provide you with ideas that you may draw upon. Note: *these streams have not been confirmed for the 2015 program and are subject to change based on the course proposals received.*

Engineers Change the World

Courses in this stream may draw from a variety of disciplines including, but not limited to, Civil, Chemical, Materials Science, Mineral or Environmental Engineering. Concepts that may be covered include:

- Sustainable materials, design or transportation; water resource engineering; water and wastewater treatment; environmental microbiology; ecology; preventative engineering; waste management; life cycle analysis; risk assessment; alternative energy development, etc.

Previous course titles included: “A World of Water,” “Sustainable Transportation,” and “Engineer Your Environment: From Climate Change to Alternative Energy Solutions.”

Biomedical Engineering

Courses in this stream will cover a variety of Biomedical Engineering principles and may include:

- Neural, sensory systems and rehabilitation engineering; tissue engineering and regenerative medicine; molecular imaging and systems biology; engineering in a clinical setting; bioprocess engineering; medical nanotechnology; biomaterials, etc.

Previous course titles included: “Regenerative Medicine: Gene Therapy and Tissue Engineering,” “Medical Imaging: Seeing Inside the Human Body,” and “Pharmaceutical Sciences: Discovery, Design and Utilization of Therapeutic Systems.”

Mechanical Engineering

Courses in this stream will draw from the disciplines of Mechanical and Aerospace Engineering. Concepts that may be explored include:

- Manufacturing; solid mechanics and machine design; applications of mechanical engineering; aerospace engineering, etc.

Previous course titles included: “Foundations of Mechanical Engineering,” “Extreme Machines,” “Race and Production Car Engineering” and “Orbital Mechanics and Space Robotics.”

Materials Science & Engineering

Courses in this stream will draw from the disciplines of Materials Science & Engineering and Chemical Engineering and the applications of materials in other fields. Concepts that may be covered include:

- Nanoengineering; biomaterials; advanced semiconductors; forensics, etc.

Previous course titles included: “Biomaterials & Implant Technology,” “Frontiers of Nanoengineering” and “Biotechnology in Medicine.”

Electrical & Computer Engineering

Courses in this stream cover a variety of principles and may include:

- Systems control; software and hardware engineering; electronics electromagnetics; photonics; communications & networking, etc.

Previous course titles included: “Game Programming,” “Digital Hardware Design: From Home Electronics to Video Games” and “Discrete Mathematics for Computer Engineering.”

Energy Engineering

Courses in this stream focus on energy engineering as a subfield of **electrical engineering** that focuses on renewable energy, facility management, power plant engineering, energy distribution and environmental compliance. Courses in this stream will explore topics such as sustainable energy, solar energy materials and electrical power systems.

Previous course titles included: “Sustainable Energy: Innovations and Entrepreneures” and “Solar Energy Materials and Cells.”

Engineering Science

Courses in this stream focus on the foundational sciences required in the pursuit of engineering studies including Chemistry, Mathematics and Physics. Traditionally one course in each field has been offered.

Previous course titles included: “Engineering Mathematics” and “Nuclear Power: Jedi or Sith?”

Mini-MBA

Courses in this stream will draw from business, technology and Industrial Engineering. The courses should focus on business principles (economics, finance, accounting, organizational behavior, etc.) and how they apply to and are manipulated in Engineering.

Previous course titles included: “Entrepreneurship 101,” “Introduction to Project Management,” “Engineers on Bay Street” and “Healthcare Management.”

Robotics and Mechatronics

This stream draws from Electrical, Computer and Mechanical Engineering and covers concepts required in the design and construction of robotics and mechatronics projects.

Previous course titles included: “Sensors, Smart Phones & Robotics,” “Digital Logic Design,” “Artificial Intelligence and Machine Learning” and “BattleBots: Build, Battle, Destroy.”

N.B. Please do not be deterred from submitting a proposal because you do not see a stream in which your proposal “fits.” The 2015 streams have not yet been determined and we are always looking for fresh and innovative programming.

SAMPLE Course

Title: Great Challenges in Neuroscience

Proposed Grade Level: Senior (Grades 11 & 12)

Proposed Stream: Biomedical Engineering

Course Description: (When writing your potential DEEP course description please include some topics and activities that the students will be doing)

The last 30 years have seen incredible developments in the field of neuroscience. Improved technology and analysis techniques have supported an explosion of exciting scientific findings. While this has transformed our understanding of the way the brain works, it has also made us realize how little we know. We have only achieved a very basic understanding of how our 100 billion neurons work together to create human thought. Fundamental problems still need to be solved and many issues have not even been identified. Daunting challenges lie ahead. The key to improving our understanding of the brain is asking the right questions and learning the skills required to overcome the important problems. This course will explore some of the greatest challenges in the field. Students will work through labs on topics including neuroimage analysis, signal processing and microbiology of the brain to learn skills and experience some of these challenges first hand.

Theme	Course Introduction & Neuroscience Fundamentals	Challenge 1: Small data	Challenge 2: BIG data	Challenge 3: Signal processing in the brain	<u>Student challenges:</u> students to present their proposed solutions to challenges from Day 1
Lecture Topics	Brain-basics. Challenges in the field: major advancements and major obstacles. How to approach challenges: asking the right questions, problem-solving methodology.	Microbiology of the brain. Important discoveries: neurogenesis, BDNF, neurotransmitters, optogenetics.	MRI overview: how this has changed our understanding of the brain How to analyze big data	How to measure neural activity: basic EEG technology overview, analyzing and modeling brain activity. Discuss how this facilitates important scientific developments.	Our potential for impact. How to make an effective presentation. Career focus: guest lecturer from industry, academia, and/or career services.
Proposed Activities	Ice-breakers Introduce counsellors. Lab safety training Activity: in groups of 3, students will visit researchers on UofT downtown campus to interview them about their biggest challenges.* Example questions: <ul style="list-style-type: none"> • What are the biggest hurdles for you in your career, this year, today • Can you imagine a tool (real or not-yet existing) that would solve some of these problems? <p>Sheep brain dissection lab. Students to dissect sheep brains, identify specific anatomical features, and discuss functional networks.</p> <p><i>*Students will spend time throughout the week coming up with solutions to one of these problems</i></p>	Identifying specific parts of the neuron from slides of sheep brain. Perform western blot, a method commonly used to identify certain proteins in a tissue or blood. Guest speaker: Dan Hosseinzadeh, Pathcore <i>30-60 mins: Work on classroom presentation of big challenges interviews</i>	Neuroimaging tutorial: look at various MRI images, identify important structures, Neuroimaging analysis: using MATLAB, students will run an analysis of fMRI data (data previously acquired during a visual processing task). Guest Speaker: Someone from Randy McIntosh's lab, or Gregory Szilagyi <i>30-60 mins: Work on classroom presentation of big challenges interviews</i>	Acquire EEG data with tools in IBBME lab. Use Matlab to analyze these data in computer lab: progress from basic analysis to advanced techniques. Use the signal processing toolbox to filter signals, plot an event-related potential. <i>30-60 mins: Work on classroom presentation of big challenges interviews</i>	Students to present their week-long project: summarize their interview with U of T researchers, and propose their solutions to the problems. Researchers may be invited to attend the presentations, with the option to attend their specific group's presentation virtually, via teleconference or phone.
Learning Outcomes	Gain an understanding of the macroscopic and microscopic brain structure, understand the basic mechanism of memory formation and observe how advances in engineering have facilitated scientific discovery. Foster communication between scientists and students.	Students to learn a fundamental laboratory technique. Overcoming challenges of learning a new task, and gaining hands-on experience with a technique used to make relevant discoveries.	Students to gain an appreciation for the issues and benefits posed by big data: computational, statistical, logistical, ethical.	Students will learn about common diagnostic tools and develop an awareness of the need for critical evaluation. Foster communication between scientists and students. Exposure to signal analysis.	Students to learn that they have the potential to make a positive impact in an ever-expanding field. Students will also get some insight into how a career in the field could progress.

<p>How is the content you cover each day being applied to solve real world problems?</p>	<p>Students will gain sufficient understanding of neuroscience concepts to understand how drugs affect the brain, and how technology being developed at UofT is improving rehabilitation (eg Milos Popovic's functional electrode stimulation).</p>	<p>Students to learn a fundamental laboratory technique used widely in microbiology labs.</p>	<p>MRI and EEG are critical tools in neuroscience, both for basic research and clinical diagnostics.</p> <p>In addition, data processing skills are vital for a successful career in all analytical fields.</p>		<p>Past senior med students have expressed interest in learning more about potential career paths in this field.</p> <p>In my opinion, the ability to conduct an effective presentation is as important as R&D.</p>
<p>Facilities Required</p>	<p>Tutorial room Afternoon: room for dissection</p>	<p>IBBME lab</p>	<p>IBBME lab</p>	<p>IBBME lab</p>	<p>Tutorial room</p>
<p>Materials</p>	<p><i>Everyday: Laptop (instructor to provide), projector and speakers, writing utensils, poster, whiteboard or chalkboard.</i></p>				
<p>Materials</p>	<p>6 Fixed sheep brains (1 per 4 students) basin, lab jackets, goggles, rubber gloves, dissection kits.</p> <p>Cameras with video for interviews.</p>	<p>Microscopes Slides prepared with tissue samples And/or we make our own with stains? Western blot equipment</p> <p>Gift for speaker</p>	<p>Computers with MATLAB</p> <p>Gift for speaker</p>	<p>EEG equipment (in IBBME lab) Computers with MATLAB</p> <p>Gift for speaker</p>	

Part IV: Instructor Biography

Should your proposal be accepted, we will publish your biography on our website (www.deepsummeracademy.com) as a promotional piece for prospective students and their parents. Please note that your biography might be edited stylistically prior to posting.

Below is an example of an instructor biography. Please attach your instructor bio (written from a third person perspective). Your bio should be no more than 500 words.

Sample Instructor Biography:

Christopher McLaughlin

Chris was born in Toronto, Canada but raised in New York City. He came back to Canada in 2004 to attend the University of Toronto and pursue an undergraduate degree in Engineering Science because he wanted to be challenged while being surrounded by exceptional peers. Chris was very active in campus life and participated in a variety of engineering student clubs including the Skule Improv Society and the Mechatronics Design Association. He completed his degree in 2008 and is currently working on his PhD in the area of stem cell research. His research focus is on expressing cells in human amniotic fluid. His favourite courses included neuroanatomy, the iterative design process, engineering innovation and communication, nano-inspired biomaterials and biomechanics. In his free time, Chris enjoys spending time with family and friends, playing basketball and soccer, exploring the city, and, yes – spending time in his lab surrounded by inspired people.

Part V: Summary of Relevant Experience

On a separate page, and no more than 500 words, please describe any employment experience – paid or volunteer – that you believe is relevant to employment with our program. Examples may include practical teaching experience in the sciences, engineering, business or technology and/or industry experience. Additionally, please explain how you learned about this opportunity, why you are applying for this position and how you hope to inspire the next generation of students.

Returning instructors: In addition to the above, please highlight your previous experience(s) teaching DEEP including what you learned from your most recent experience and explain how it has informed your proposal submission for 2015. Finally, briefly explain why you want to come back for another year and teach DEEP (500 words maximum).

Description of Duties

Training

All instructors must attend training. The training session(s) will cover program details, curriculum development, safety protocol, safety standards, classroom management, student issues and teaching tips.

Preparation

The instructor is responsible for course preparation, including the preparation and adjustments of the course outline, as well as preparing lesson plans and lecture notes for each class as necessary. The required documents and forms will be distributed to all instructors that are successful applicants. These lessons plans and activity plans are required to be submitted to the DEEP Program Coordinator on the specified dates which occur prior to start of the course. It is the responsibility of the DEEP instructor to adjust any activities that are not approved by the department's safety officer. The instructor is responsible for developing course handouts and producing copies for course participants. There are no marked assignments, however, should the instructor wish they may choose to produce problem sets or non-marked mini-assignments for the class, depending on the nature of the particular course. The instructor is responsible for preparing audiovisual items to be used in class and will also set up any audiovisual equipment required (such as laptops and projectors).

The instructor is responsible for conceptualizing, designing and preparing for any hands-on activities and experiments to be conducted in the course; this includes demos, prototypes, etc. Finally, the instructor should seek assistance from the DEEP office, as needed, in developing curriculum and hands-on activities. The instructor acknowledges that the content of the course will conform to the description of the course on the DEEP website and any other DEEP publications. Preparation time is calculated as 40 minutes per contact hour.

Contact

The instructor(s) will be present in class at all times and will facilitate the entire course. This will include conducting lectures, facilitating class discussion and/or debate and conducting laboratory and design activities with the class. The instructor will be responsible for demonstrating laboratory and design activities and providing in-class assistance to the participants. The instructor will lead any applicable course field trips. Finally, the instructor will make use of the course volunteer (if applicable) while in-class.

Marking/Grading

There are no marking or evaluation duties.

Other Duties

The DEEP instructor is required to meet with their course volunteers prior to the start of the course and remain in close communication with their volunteers to ensure the smooth delivery of the course. DEEP instructors are expected to communicate any and all concerns and incidents to the DEEP office immediately. Instructors are required to take class attendance 2+ times a day as instructed by the DEEP Coordinator and comply with any safety procedures outlined in training. Instructors are responsible for leading their class from opening ceremonies to their assigned lab/lecture hall every Monday morning and delivering their entire class back to the agreed upon meeting place at the end of class every day. Instructors are required to be part of the closing ceremonies each Friday. Instructors are required to complete all course feedback forms in a timely fashion and submit them to the DEEP office at the completion of each course. Instructors are encouraged to offer support and guidance, and demonstrate leadership to all DEEP participants being mindful that they are representing the Faculty of Applied Science & Engineering and the University of Toronto.

DEEP RFP Process – Future Dates to Remember

October 15th 2014: Request for proposals open

November 17, 2014: DEEP interviews start

November 30, 2014: Request for proposals closed

December 15, 2014: Conditional offers begin to be extended

March 27, 2015: All final DEEP course documents due

Mid to late May 2015: Instructor training conference

Early to mid June: Instructor counsellor meet and greet

July 6, 2015 – July 10, 2015: DEEP Summer Academy Week 1

July 13, 2014 – July 17, 2015: DEEP Summer Academy Week 2

July 20, 2014 – July 24, 2015: DEEP Summer Academy Week 3

July 27, 2014 – July 31, 2015: DEEP Summer Academy Week 4 (Design & Innovation Week)

* Instructor training is mandatory. The Engineering Outreach Office is currently in the process of finalizing the dates and will advise successful applicants as soon as possible.