# IN-SCHOOL Workshops

SCIENCE, TECHNOLOGY, ENGINEERING & MATH WORKSHOPS FOR GRADES 3 TO 8



Engineering

Engineering | Outreach

ELNIVERSITY OF TORONTO EXCULAY ENVILUE SEENS TO SEAL OF THE SEENS TO THE SECOND TO THE SEENS TO THE SEENS TO THE SEENS TO THE SECOND TO THE SEENS TO THE SEENS TO THE SEENS TO THE SECOND TO THE SEENS TO THE SECOND TO THE S PO

# **IN-SCHOOL WORKSHOPS** SCIENCE, TECHNOLOGY, ENGINEERING & MATH WORKSHOPS FOR GRADES 3 TO 8

We link our workshops to Ontario curriculum expectations and are pleased to offer the following workshops to grade 3 to 8 classes. For pricing and booking instructions, please see the back cover. Each workshop can accommodate a maximum of 30 students and is offered at your school. Workshops for 2017 are offered between May 12 and June 16. *Our workshops can be customized for different grades* — *please contact us with specific request.* 

### UNDERSTANDING LIFE SYSTEMS

WORKSHOP Title	ACTIVITY Description	GRADE	TOPICS	ONTARIO CURRICULUM Connection	UNIVERSITY DISCIPLINE Connection
Creature Creation (LS-1)		<u>Gr. 3</u>	Structural adaptations that allow animals to survive in specific habitats; impact of the environment on specialized and generalized species	Understanding Life Systems: Habitats and Communities	Biology / Bioengineering
	construct a unique creature using principles of adaptation for survival in specific environments and ecosystems	lden laptation Gr.4 Iden amo c plan	Identification of factors (availability of water or food, amount of light, type of weather) that affect the ability of plants and animals to survive in a specific habitat	Understanding Life Systems: Habitats and Communities	Biology / Bioengineering
	environments and ecosystems.	Gr.6	Characteristics of organisms; classification systems; biodiversity and its role in maintaining the resilience of species	Understanding Life Systems: Biodiversity	Biology / Bioengineering
Gene Machine (LS-2)	Students will extract DNA from plant cells through chemical processes and explore the structure and importance of cells.	Gr. <b>6</b>	Distinguishing characteristics of plants and animals; role of biodiversity; cell theory; DNA; principles of heredity	Understanding Life Systems: Biodiversity	Biology / Bioengineering
		<u>Gr. 8</u>	Cell theory; structures and organelles in cells; characteristics, structure and function of plant and animal cells; DNA; principles of heredity	Understanding Life Systems: Cells	Biology / Bioengineering

UNDERSTANDING STRUCTURES & MECHANISMS							
WORKSHOP Title	ACTIVITY Description	GRADE	TOPICS	ONTARIO CURRICULUM Connection	UNIVERSITY DISCIPLINE Connection		
Hydraulic Hijinks (SM-1)	Students will design and construct a hydraulic crane as a working mechanical	Gr. <b>5</b>	Technological problem-solving skills to design, build and test a structure and mechanical system that performs a specific function; the advantages and disadvantages of different types of mechanical systems	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms	Mechanical Engineering		
	system.	Gr. 8	Technological problem-solving skills to investigate a system that performs a function; relationship between work, force and distance; mechanical advantage	Understanding Structures and Mechanisms: Systems in Action	Mechanical Engineering		
Colossal Super- structures (SM-1)	Students will design, build and test structures that can	Gr.5	Factors that impact the strength of a structure and its ability to support and resist loads; materials and construction techniques that add strength and stability to structures; vocabulary, including compression, tension, strenght and stability; problem- solving skills in designing, building and testing a strong structure that serves a purpose.	Understanding Structures and Mechanisms: Strong and Stable Structures	Mechanical Engineering Civil Engineering Civil Engineering		
	withstand applied loads.	<u>Gr. 8</u>	(Understanding Structures and Mechanisms: Systems in Action) - Technological problem-solving skills to design, build, and test a device according to client specifications, examination of the effects of various components of the system and how they affect its function and output	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms			
		<u>Gr. 7</u>	Social, economic and environmental factors that influence the way structures are designed and built; the relationship between structural design elements and the forces that act on them; comparison of different forms and how they support or withstand loads; problem-solving skills in building three-	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms	Civil Engineering		

dimensional structures based on engineering drawings

# **IN-SCHOOL WORKSHOPS** SCIENCE, TECHNOLOGY, ENGINEERING & MATH WORKSHOPS FOR GRADES 3 TO 8

UNDERSTANDING STRUCTURES & MECHANISMS						
WORKSHOP Title	ACTIVITY Description	GRADE	TOPICS	ONTARIO CURRICULUM Connection	UNIVERSITY DISCIPLINE Connection	
Indy 500 (SM-5)		Gr.4	Investigations into rotary motion in one system or its components and how energy is transferred to another system or component in the same structure	Understanding Structures and Mechanisms: Pulleys and Gears	Aerospace Engineering	
	Students will design, build and test a model racecar.	Gr. 5	Technological problem-solving skills to design, build and test a structure; external forces acting on a structure; design, build and test integrating principles of aerodynamics; evolution and change in systems	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms	Aerospace Engineering	
		Gr. 6	Applications of the properties of air; different forces (thrust, drag, lift, weight); design, build and test integrating principles of aerodynamics	Understanding Structures and Mechanisms: Flight	Aerospace Engineering	

UNDERSTANDING MATTER & ENERGY						
WORKSHOP Title	ACTIVITY Description	GRADE	TOPICS	ONTARIO CURRICULUM Connection	UNIVERSITY DISCIPLINE Connection	
Alarm Systems (ME-1)		Gr. 3	Properties of light; properties of sound; technological problem-solving skills to design, build and test a device that makes use of the properties of light or sound	Understanding Matter and Energy: Light and Sound	Electrical Engineering	
	Students will create working alarm systems using circuit components.	Gr.4	Use technological problem-solving skills to design, build, and test a device that makes use of the properties of light or sound	Understanding Matter Electrical and Energy: Light and Engineering Sounds	Electrical Engineering	
		<u>Gr. 6</u>	Series and parallel circuits; circuit components; design, build and test an alarm system that transforms electrical energy into another form of energy to perform a function; conductors and insulators of electricity	Understanding Matter and Energy: Electricity and Electrical Devices	Electrical Engineering	
Forensic Fun (ME-2)	Students will use knowledge of chemical interactions to solve a mystery. Br.5 Use of scientific experimentation skills to investigate Under Changes of state and matter; identify properties of solids, liquids and gases Char Properties of pure substances and mixtures; particle Under theory of matter; experimentation skills to investigate and Under Char Char Char Char Char Char Char Char	Understanding Matter and Energy: Properties and Changes in Matter	Chemical Engineering			
		Gr. 7	Properties of pure substances and mixtures; particle theory of matter; experimentation skills to investigate the properties of mixtures and solutions	Understanding Matter and Energy: Pure Substances and Mixtures	Chemical Engineering	

**UNDERSTANDING SPACE & EARTH SYSTEMS** WORKSHOP ACTIVITY **ONTARIO CURRICULUM** UNIVERSITY DISCIPLINE GRADE TOPICS DESCRIPTION CONNECTION CONNECTION TITLE Extreme Students will design, build and Understanding Earth Technological problem-solving skills to design, build Roller-Mechanical test model roller-coasters, while and Space Systems: and test a device that transforms one type of energy Gr. 5 Coasters applying laws of physics and Conservation of Energy Engineering into another; Law of Conservation of Energy principles of design. and Resources (SE-1) Social and environmental costs and benefits of using Understanding Earth Aerospace Gr.4 objects in the built environment that are made from rocks and Space Systems Engineering and minerals Rocket Students will build and test rockets

Science! (SE-2)

to investigate the principles of aerodynamics.



Components of the solar system; technological tools and devices needed for space exploration; physics of flight and forces acting on an object in flight

Understanding Earth and Space Systems: Space

Aerospace Engineering

# **CODING WORKSHOPS** SCIENCE, TECHNOLOGY, ENGINEERING & MATH WORKSHOPS FOR GRADES 3 TO 8

\*Plugged Coding Workshops are only offered at the St. George Campus at University of Toronto. To make arrangements to book a workshop, please contact us for details.

WORKSHOP TITLE	ACTIVITY Description	GRADE	TOPICS	ONTARIO CURRICULUM Connection	UNIVERSITY DISCIPLINE Connection
Urban Planning with Augmented	Students will design functional and accessible cities, and learn to use Augmented Reality software (Linity, to create 3D projections	Gr. <b>5</b> Gr. <b>6</b>	Factors of terrain and habitat interacting with urban development; importance and benefits of urban planning both on a micro and macro scale.	People and Environments: Living and Working in Ontario	Civil / Computer Engineering
(Plugged*)	from their layouts and bring their cities to life.	Gr. 7 Gr. 8	Displaying and viewing virtual objects in augmented reality and computer vision targeting; digital manipulation of 3D objects.	Geometry and Spatial Sense	Computer Engineering
App Development: Design for User Experience (Plugged*)	Students will create their own unique Android app using MIT App Inventor while learning about different clearnest of designer on	Gr. 3 Gr. 4	Definitions and understanding of key terms (ex) app, procedure, computer science.	Reading Comprehension, Listening Skills	Computer Engineering
	application.	Gr. <b>5</b> Gr. <b>6</b>	User Experience and the critical analysis and creation of apps.	Disciplinary / Critical Thinking, Media Arts	Industrial Engineering (Human Factors)
		Gr. 7 Gr. 8	Proper coding practices and use of flowcharts or other graphical organizers as a planning tool.	Cause and Consequence, Continuity and Change	Computer/Environmental Engineering
Introduction to Programming 101	Students will learn about programming, logical thinking and engineering methodologies to code their own programs using	Gr. 3 Gr. 4	Definitions and understanding of key terms (ex) app, procedure, computer science.	Cause and Consequence, Continuity and Change	Computer/Environmental Engineering
(	Scratch.	Gr. <b>5</b> Gr. <b>6</b>	Proper coding practices and use of flowcharts or other graphical organizers as a planning tool.	Data Management	Computer Engineering, Applied Mathematics
Introduction to Programming 102	Students will transition from block based to text based programming and apply programming principles and logical thinking to	Gr. <b>5</b> Gr. <b>6</b>	Definitions and understanding of key terms (ex) app, procedure, computer science	Reading Comprehension, Listening Skills	Computer Engineering
(Plugged*)	code a program using Java commands.	Gr. 7 Gr. 8	Proper coding practices and use of graphical organizers as a planning tool; create interactive maps through iterations in code	Data Management, Media Arts	Industrial Engineering (Human Factors)
How to think like an Engineer: Problem Solving (Unplugged*)	Students will learn to use professional techniques used by engineers and computer scientists to solve, organize and strategize complex problems by applying them to different scenarios and fun games.	Gr. 3 Gr. 4	Differences and similarities in the manner in which computers and humans process data and its application to algorithm development; diagrammatic representation of code in the form of flowcharts and blocks as a planning and organizational tool	Reading Comprehension, Geometry and spatial sense	Computer Engineering
Unplugged	Students will develop a mindset of a		The three types of errors that exist in computer	Data management	Commuter Englished

Unplugged Coding and Computational thinking (Unplugged\*)

Students will develop a mindset of a programmer by learning about the inner workings of a computer, good coding practices and different algorithms by applying them to their daily routlines.



programming and strategic debugging methods; diagrammatic representation of code in the form of flowcharts and blocks as a planning and organizational tool

Data management and Probability

**Computer Engineering** 

# **LEADERSHIP WORKSHOPS** SCIENCE, TECHNOLOGY, ENGINEERING & MATH WORKSHOPS FOR GRADES 3 TO 8

WORKSHOP	ACTIVITY	GRADE	TOPICS	ONTARIO CURRICULUM	STEM
TITLE	DESCRIPTION			CONNECTION	CONNECTION
Extreme Roller Coaster Design Challenge	Students will work in teams to design, build, and test model roller coasters in a rapid prototyping session, while applying	Gr.5	Technological problem-solving skills to design, build and test a device that transforms one type of energy into another; Law of Conservation of Energy; Designing with varying client specifications in mind.	Understanding Earth and Space Systems: Conservation of Energy and Resources	Mechanical Engineering
	design, budgetary considerations and client specifications.	Gr. 8	Technological problem-solving skills to design, build, and test a device according to client specifications, examination of the effects of various components of the system and how they affect its function and output.	Understanding Structures and Mechanisms: Systems in Action	Mechanical Engineering
No Bones About it	Students will examine how components of the human skeleton come together to allow us to function in the ways we do. They will then look to comparative anatomy	Gr.5	Investigating how the skeletal system works with other systems in the body to help us function the way we do; using bio-inspired design in engineering to help improve lives for those with injury or disease; exploring comparable systems in other living things	Understanding Life Systems: Human Organ Systems	Biomedical Engineering, Materials Science
	to learn more about living organisms and their environment as inspiration for innovation.	<u>Gr. 7</u>	Investigating the factors and structures that allow the body to do the things it does; Biomimicry and bio-inspired design in engineering to help improve lives those with injury or disease; exploring comparable skeletal structures of other living things	Understanding Structures and Mechanisms: Form and Function	Computer/Environmental Engineering
Emergency Shelters	Students will create shelters for an emergency situation while testing their communication, teamwork and collaboration skills. Structures will be tested for stability and efficiency of their design in context. Students will work together to resolve challenges and explore priorities in a time of crisis.	Gr. 3	Factors that impact the strength and stability of a structure; problem-solving skills in designing, building and testing a strong and stable structure that serves a purpose; forming a collaborative and mutually beneficial set of community standards	Understanding Structures and Mechanisms: Strong and Stable Structures	Civil Engineering
		context. Students will work together to resolve challenges and explore priorities in a time of crisis.	Gr.5	Internal forces acting on a structure (compression, tension); external forces (wind, movement); building a stable structure to support a load; how structures are built to withstand forces; the role of citizens in a community; taking a leadership role in a time of crisis; working as a team; effective communication and the various forms it can take.	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms; Social Studies: The Role of Government and Responsible Citizenship
		<u>Gr. 7</u>	Investigating the relationship between the design and function of various structures; factors that need to be considered in structure design; effective communication and teamwork in a time of crisis.	Understanding Structures and Mechanisms: Form and Function	Civil Engineering
What is Engineering Design?	Students will look at the engineering design and innovation process on a smaller scale, examining all of the detailed decisions that must be made along the way and how they impact a final product.	Gr.5	Examining forces acting on a mechanism to inform the design of an improved mechanism; rapid prototyping and the engineering design cycle; importance of giving and receiving constructive feedback as a leader in science and engineering; the engineering design process.	Understanding Structures and Mechanisms: Forces Acting on Structures and Mechanisms	Mechanical Engineering
		<u>Gr. 7</u>	Investigating the relationship between the design and function of a mechanism and the forces that act upon it; rapid prototyping and the engineering design cycle; importance of giving and receiving constructive feedback.	Understanding Structures and Mechanisms: Form and Function	Industrial Engineering (Human Factors)



## HOW TO BOOK AN IN-SCHOOL WORKSHOP

Select your workshops. We offer a wide range of workshop topics that are grade-specific, fun and kid-friendly. Each workshop is 2.5 hours in length. We are pleased to offer special pricing on workshop packages for schools. If other teachers in your school are interested in booking workshops, we encourage you to book together to save money. Please note, each workshop can accommodate a maximum of 30 students.

Complete the booking form. We schedule workshops on a first-come-first-served basis. Book early for preferred dates!

#### **3** Send your completed form to our office by email:

EMAIL: workshop@ecf.utoronto.ca

DOWNLOAD THE FORM: www.uoft.me/isw

The University of Toronto's Faculty of Applied Science & Engineering is committed to inspiring young minds in the areas of science, technology, engineering and math (STEM). We achieve this through a wide range of year-round, hands-on programs for children of all ages. Last year, we reached more than 5,000 pre-university youth. Some of our programs include:

.....

JR. DEEP (SUMMER, GR. 3–8) GIRLS' JR. DEEP (SUMMER, GR. 3–8) JR. DEEP SATURDAYS (FALL AND WINTER, GR. 3–8) GIRLS' JR. DEEP SATURDAYS (FALL AND WINTER, GR. 3–8) JR. DEEP AT MARCH BREAK (MARCH, GR. 3–8) DEEP SUMMER ACADEMY (SUMMER, GR. 9–12)

## After you receive your confirmation, leave the rest to us!

Our instructors will bring the necessary materials for all activities.





## ENGINEERING OUTREACH OFFICE, UNIVERSITY OF TORONTO

35 St. George Street, Room 173, Toronto, ON M5S 1A4 Canada Email: workshop@ecf.utoronto.ca | www.outreach.engineering.utoronto.ca Tel: 416-946-0816

## WORKSHOP PACKAGES & PRICING

Booking In-School Workshops with other teachers in your school is the most costeffective way to bring these enriching workshops to your classroom. Packages can be split among different grade levels and classrooms (maximum 30 students per workshop) within your school, but all workshops must occur on the same day.

## SCHOOL PACKAGE I: FULL-DAY \$1,700

12 workshops @ 2.5 hrs each

SCHOOL PACKAGE II: HALF-DAY \$875 6 workshops @ 2.5 hrs each

#### **INDIVIDUAL WORKSHOPS \$170** 1 workshop @ 2.5 hrs each

Priority will be given to schools with multiple bookings.



Actua provides training, resources and support to its national network of members located at universities and colleges across Canada in the delivery of science, technology, engineering and mathematics (STEM) education outreach programming. Each year, these members engage over 225,000 youth in 500 communities nationwide. Please visit Actua at **www.actua.ca**.

2016 ACTUA ONTARIO FUNDER

Ontario Trillium Foundation

#### 2016 ACTUA NATIONAL FUNDERS Google Suncor Energy Foundation

GE Canada Natural Sciences and Engineering Research Council of Canada Shell Canada

## **IN-SCHOOL WORKSHOPS 2017 BOOKING FORM**

For online registration, please visit www.uoft.me/isw

## CONTACT INFORMATION

MAIN CONTACT:	FIRST NAME		LAST NAME			
	PHONE NUMBER		EMAIL ADDRESS			
SCHOOL:	SCHOOL NAME				BOARD	
ADDRESS:	STREET NO. & NAME			СІТҮ		POSTAL CODE
	NEAREST INTERSECTION TO SCHOOL			•••••		
PHONE:	PHONE	EXTENSION				

## WE OFFER IN-SCHOOL WORKSHOPS ON THE FOLLOWING DATES: MONDAY TO FRIDAY FROM MAY 12 TO JUNE 16, 2017.

To schedule workshops outside the May 12 to June 16 window, please email your preferred dates to **workshop@ecf.utoronto.ca** to check availability before submitting this form.

## Which dates would you prefer us to visit your school?

	•••••••••••••••••••••••••••••••••••••••
REQUESTED DATE:	ALTERNATIVE DATE:

To help us schedule your workshops, please provide your school schedule:

• • • • • • • • • • • • • • • • • • • •		
START:	LUNCH:	END:

## **WORKSHOP REQUESTS**

**Please note:** Each workshop can accommodate a maximum of 30 students and is offered at your school. Please email us at **workshop@ecf.utoronto.ca** for more information.

TEACHER	GRADE	# OF STUDENTS	WORKSHOP TITLE	START TIME	END TIME
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

If you are not booking online, please email or mail this form to us. After we receive your form, we will send you a confirmation and invoice to the email address provided. Workshops are not officially booked until you receive confirmation. We look forward to hearing from you!

## **CONTACT IN-SCHOOL WORKSHOPS**

In-School Workshops, University of Toronto 35 St. George Street, Room 173, Toronto ON M5S 1A4 Canada Email: workshop@ecf.utoronto.ca | Online registration: www.uoft.me/isw | Tel: 416-946-0816