Summer at WPI
College life—just like you imagined
FRONTIERS LAUNCH
Frontiers is an on-campus, residential, research, and learning experience that challenges soon-to-be high school juniors and seniors to explore the outer limits of knowledge in science, mathematics, and engineering. Now in its 33rd year of operation, it continues to be enthusiastically received by its participants. You will learn from outstanding professors and graduate students and interact with other participants from across the country and around the globe.

You will learn from outstanding professors and graduate students and use state-of-the-art experimental, analytical, and computer technology. WPI students majoring in your area of study will assist you in the lab and in study groups.

Frontiers focuses on current laboratory techniques and unsolved problems in aerospace engineering, biology/biotechnology, biomedical engineering, chemistry/biotechnology, civil and environmental engineering, computer science, electrical and computer engineering, environmental and sustainability studies, interactive media and game development, mathematics, mechanical engineering, and physics (Session I); and robotics, women’s leadership, engineering exploration, and—new this year—Introduction to Actuarial Math, Exploring Engineering Software, and Cybersecurity (Session II).

Rounding out the academic experience are Humanities and Arts workshops in areas such as writing, art, music, speech, history, international studies, law, and theatre. A full schedule of activities, including evening workshops, field trips, movies, live performances, and tournaments, will ensure that your stay at WPI is more than just an academic experience. You’ll have the chance to meet current WPI students who serve as program leaders, and interact with other participants from across the country and around the globe.

Throughout your stay on campus, you will have accounts on WPI’s computer system. We think you’ll find this summer enrichment experience challenging, well-balanced, and loads of fun.

SESSION I: JULY 5–17, 2015
(Session I participants enroll in a science, technology, or engineering program and a humanities and arts workshop.)

Science, Technology, Engineering, and Math

AEROSPACE ENGINEERING
Explore the science of flight to learn how wings and aircraft create lift to fly. Basic concepts in aerodynamics—including drag, streamlining, airflow, and aircraft design—will be studied. You’ll conduct wind- and water-tunnel experiments to visualize the flow over aircraft, and run computer simulations for different airflow shapes. Using what you have learned, you’ll design and build a simple model aircraft, test it in the wind tunnel, and see it soar in free flight.

BIOLOGY, BIOTECHNOLOGY, AND BIOINFORMATICS IDENTIFICATION, INVESTIGATION, AND SIMULATION
Join us for two weeks of fun while exploring some current topics in biology and biotechnology. Become part of a crowdsourcing initiative to develop new antibiotics, learn about the pollinator crisis and work with a computer simulation involving bee behavior, investigate how molecular biology and genetic barcoding can reveal environmental concerns. Along the way you’ll also have fun learning about the roots of biotechnology by fermenting our own root beer and making ice cream using liquid nitrogen.

BIOMEDICAL ENGINEERING
At the crossroads of engineering, biology, and medicine lies an exciting science making historic breakthroughs that are extending lives, re-enabling the disabled, and vastly improving our quality of life. This is biomedical engineering, and WPI is at the forefront of research that is leading to many of these breathtaking developments. You will develop innovative solutions to real-world problems. You will also build and test prototypes in this exciting field.

Spend a couple of weeks of your summer engaged in our project-based biomedical engineering program and begin addressing our nation’s medical needs.

CHEMISTRY AND BIOCHEMISTRY
Zoom into the level of electrons and nuclei, and investigate how atomic building blocks assemble the periodic tables to form the world around us. Apply the newest technologies to modern challenges in chemistry and biochemistry: peel apart proteins and DNA, discover how enzymes work, model molecules in 3-D, leverage molecular self-assembly to change bulk properties, harness light-matter interactions at the molecular level, and explore new routes to solar energy conversion. You will manipulate color, fire, light, and electricity by changing chemical properties, and you will employ genetic techniques to create organisms that glow!

CIVIL AND ENVIRONMENTAL ENGINEERING
The field of civil and environmental engineering is essential for improving the quality of life in our society and protecting the environment. This discipline includes sustainable design and construction of roads, bridges, tunnels, dams, tall buildings, and water and wastewater treatment plants, among others. You will complete hands-on projects involving laboratory testing of materials and structures, computer analysis and design of structures, water quality sampling and testing, and computer analysis to understand how human activities affect water quality in the environment. Students who attend Session I may be interested in continuing to explore topics of sustainability in Session II, Global Sustainability.

COMPUTER SCIENCE
In this self-paced program, you’ll have the opportunity to explore the world of programming as it is used on the Internet, and object-oriented languages, such as Java. You’ll also explore graphical and distributed programming environments. You’ll have the chance to incorporate the work as part of effective multimedia interfaces for content of interest to you. In addition, special topics in computer science will be discussed according to student interest.

ELECTRICAL AND COMPUTER ENGINEERING
Discover the fascinating world of electrical and computer engineering through classroom exercises and laboratory hands-on activities. Build and solder projects you can take home, including a heart-pulse indicator and binary clock. Learn to use lab equipment, such as power supplies, function generators, and oscilloscopes to test circuits. Suppose you apply this knowledge to a design project that you’ll be working on throughout the course. Topics include audio amplification, biomedical application, analog signal processing, and digital logic.

ENVIRONMENTAL AND SUSTAINABILITY STUDIES
Environmental professionals not only must be competent in science or engineering, they must understand the integrated, interdisciplinary nature of environmental problems, their causes, and solutions. Why? Today’s environmental professionals—whether working to preserve a resource or an ecosystem, whether building a bridge or a waste-water treatment plant—must design for and communicate with a wide range of interest groups. In this program, you will discuss the integration of the scientific, technical, and social dimensions of environmental issues. You will engage several key contemporary environmental themes and conduct hands-on fieldwork with local organizations. Students who attend this Frontiers I session may be interested in continuing to explore topics of sustainability in Global Sustainability, Session II.

INTERACTIVE MEDIA AND GAME DEVELOPMENT
Combine technology with art to create an interactive experience. Take on the role of level designer and bring art and technology together to create a virtual world. Draw and model your environment, add your characters and sound effects, and tell your story. Break down your idea into simple rules, write your algorithm, use powerful scripting languages, and playtest your game with your friends.
FILM AND THE INTERNET

**Students in Session II will select one STEM workshop and one HUM (Humanities & Arts) workshop.**

**THEATRE**

Produce a show from soup to nuts in less than two weeks. Set the stage, play the role, design sets, arrange lights, and record the sound, and more. Explore a wide variety of theatrical exercises and techniques, including warm-ups, expressive movement exercises, collective improvisation, and interpretive reading. Put theory into practice and have an impact on the audience by making them laugh, cry, and maybe even think. On stage or backstage, there is a role for all.

**SESSION II: JULY 19–31, 2013**

* Students in Session II will select one STEM workshop and one HUM (Humanities & Arts) workshop.

**ROBOTICS**

Immerse yourself in robotics and discover the science and technology behind robot design and operations. Learn sensor operations, programming, pneumatics, and manufacturing techniques and use this information to solve a challenging robotics problem. Each subgroup in the session will brainstorm, design, build, and test its own creation. Throughout the program, you’ll spend time outside the lab exploring how robots function, including the physics of Angry Birds, modeling the geometry of nature, and monitoring heart rate and blood pressure. You will be exposed to the artistry of technical computing by exploring concepts such as the RGB color model, fractals, randomness and self-organization, cellular automata (Game of Life), network, and six degrees of separation. Software tools used include MATLAB, MathCAD, and LabVIEW.

No previous programming experience is required.

**CYBERSECURITY - New this year**

Cybersecurity is at the forefront of contemporary issues for computer systems. WPI is pleased to offer this new workshop experience in Frontiers II. Working with WPI faculty, you will have the opportunity for significant hands-on experience with such topics as Web-App security, network security, forensics, system security, cryptography, and privacy. Scholarships may be available to partially support participants in this workshop.

**ENGINEERING EXPLORATION**

Students will explore engineering careers and learn about the various engineering disciplines such as civil, electrical/computer, mechanical, industrial, and biomedical, through hands-on activities and projects.

This Frontiers track will emphasize the role of engineers as creative problem solvers making a difference in society. Participants will also learn how best to prepare in high school to major in engineering in college.

* Engineering disciplines offered are based on faculty availability and are subject to change. Specific disciplines will be announced based on availability.

**EXPLORING ENGINEERING SOFTWARE - New this year**

Using powerful software tools, you will gain experience with programming and data analysis through a variety of exercises, including the physics of Angry Birds, modeling the geometry of nature, and monitoring heart rate and blood pressure. You will be exposed to the artistry of technical computing by exploring concepts such as the RGB color model, fractals, randomness and self-organization, cellular automata (Game of Life), network, and six degrees of separation. Software tools used include MATLAB, MathCAD, and LabVIEW.

No previous programming experience is required.

**WOMEN’S LEADERSHIP ACADEMY**

**Setting your future direction** is a catalyst to train and prepare young women to set goals for studies and a career in science, technology, engineering, mathematics, and/or management. In this program, you will discover your dreams and destiny for college plans through goal setting and exploring career paths; understand your individual strengths, interests, and beliefs and how they create a foundation for your future job skills; develop your personal compass based on the habits of successful people and how a positive belief system has the power to create opportunities; learn financial literacy, time management skills, communication skills, and ways to find scholarship opportunities; and scope out your long-term goals, your long-term goals, and your life vision of success.

Through classroom-based enrichment activities, you will learn how to plan and lead yourself with your next steps for college. Panel discussions with current WPI students and WPI alumni and staff will offer you the opportunities to explore what others have learned as they created their future direction. This is a great option for women who would like to attend both Sessions I and II.
HUMANITIES AND ARTS

WORKSHOPS – SESSION II

CINEMATIC STORYTELLING

The course explores the dramatic principles of storytelling, how to translate story ideas into screenplay format, and how the screenplay is used as a basis for shooting a film. The class will develop a short story idea together, following dramatic principles and using an underlying theme as a guide to the story development process. The class will then learn how to convert the screenplay into storyboards and a shot list, conveying the important ideas through cinematic images and compelling dialog.

CREATIVE WRITING

Conduct a series of experiences with words, imagining, and ideas: fiction, nonfiction prose, poetry, or playscript. What you create will depend on your group, hands-on activities, and conduct research about these different topics, participate in workshops, and transcript(s). Late applications will be considered on a space-available basis.

DIGITAL PAINTING

In this workshop, you will have the opportunity to learn the art of digital imaging using state-of-the-art software and computer technology. Techniques covered will include photo manipulation, digital painting, and illustration.

ELEMENTS OF WRITING

Investigate what happens when an author chooses certain vocabulary, sentence structure, and overall organization. This approach will help you improve the expository writing you will have to do in college. You will also be given an opportunity to write college application essays in which you may reveal your individuality. You are encouraged to bring with you topics that appear on admission forms for colleges where you intend to apply.

MAGIC, PHILOSOPHY, AND KNOWING

From the parting of the Red Sea to Hermon Granger casting spells with her wand, magical myth has fascinated us. Every human culture we are aware of has practiced magic. But what is magic, and what does our continuing interest in magic tell us about belief, skepticism, and the relationship between faith and science? Does our interest in magic today reveal our longing for a bygone world in which we humans were yet not estranged from nature, from other beings? Does the fact that our senses and minds can be so easily fooled by a magician performing on stage tell us anything important about the problem of knowledge? We will explore the sometimes-fine line between reality and illusion, rational belief and magical faith, through shared readings in epistemology and metaphysics—and live magic performed in the classroom.

PSYCHOLOGY

Psychological science is the experimental study of human thought and behavior in order to understand why people do what they do. The goal of this Frontiers experience is to provide insight into psychological science and also its application to the real world, other sciences, and engineering. To do so, this course will offer a broad introduction to different topics in psychological science, such as the brain, development, sensations and perceptions, thinking, learning, memory, psychological disorders, and our social environment. You’ll learn about these different topics, participate in hands-on activities, and conduct research projects.

GLOBAL SUSTAINABILITY

Stretch your mind by exploring global problems and learn how to produce clean water, renewable energy, and a sustainable agriculture while protecting biodiversity. The concept of sustainability is often discussed but rarely fully understood. How many definitions are there and how do we determine what actions are truly sustainable? This program will explore the concept of sustainability and the role of appropriate technology in creating more sustainable communities. The class culminates in a project where you will identify a specific problem—like water pollution, non-renewable energy, or inefficient buildings—and design a technological or social solution.

THEATRE

Produce a show from soup to nuts in less than two weeks. Set the stage, play the role, dress the part, hang the lights, record the sound, and more. Explore a wide variety of theatrical exercises and techniques, including warm-ups, expressive movement exercises, collective improvisation, and interpretive reading. Put theory into practice and have an impact on the audience by making them laugh, cry, and maybe even think. On stage or backstage, there is a role for all.

Tuition

Tuition for Session I or Session II is $2,595. Tuition for Sessions I & II is $4,495. Your tuition payment covers academic programming, room, board, and activities. Personal expenses vary, but should not exceed $100. A $500 nonrefundable deposit, which is applied to the tuition, is due by May 31, 2015, with the enrollment forms. The program balance is due by June 15, 2015.

Room and Board

Frontiers participants will be accommodated in one of WPI’s residence halls, supervised by current students and administrative staff. Rooms are triple occupancy; private rooms are not available. Meals will be served in one of WPI’s on-campus dining facilities, or at an appropriate off-campus location during field trips. With advance notice, we are happy to accommodate participants who may have dietary restrictions with specially prepared meals.

To Apply

This program is offered to soon-to-be high school juniors and seniors only. Applications can be submitted online at wpi.edu/+frontiers, and are due with supporting materials by April 30, 2015. Completed applications are reviewed on a rolling basis beginning March 1. Applicants are notified of the decision on their application about three weeks from the time the application becomes complete. The sooner your application is complete, the sooner we can provide you with a decision.

APPLICATION INSTRUCTIONS

Send application support materials here: WPI FRONTIERS PROGRAM Barlett Center 100 Institute Road Worcester, MA 01609-2280 Please be sure to include applicant’s name and birthdate on checks and all supporting materials.

wpi.edu/+frontiers
grades, tests, or quizzes at Frontiers. Although no college credit is offered for it’s hands-on and well-rounded, and it mirrors the WPI undergraduate program—faculty-supervised graduate students or areas of study are led by WPI faculty or led by WPI faculty. Humanities and Arts. All of the Frontiers STEM areas of study are of the program and may not bring a vehicle with them. Students eat in WPI dining facilities for all meals on campus. Usually, breakfast is 7:30–8:30 a.m., lunch is 12:30–1:30 p.m., and dinner is around 5:30 p.m. every day. There is a wide variety of food selections daily, including vegan/vegetarian/kosher options, salad bar, hot entrees, etc. The dining staff is happy to accommodate any special needs/restrictions with advance notice.

WHAT WILL I KNOW IF I HAVE BEEN ACCEPTED TO THE PROGRAM? Completed applications are reviewed on a rolling basis beginning March 1. Applicants are notified of the decision on their application about three weeks after their application becomes complete. Admitted students will receive priority placement in their program of choice based on space availability at the time of acceptance. If selected, every effort will be made to place you in your first choice area of study or workshop. However, we will enroll you in your second or third choice if your first choice program has been filled. Applications submitted after the April 30 deadline will be considered on a space-available basis.

WHAT WILL MY ROOM AND BOARD ACCOMMODATIONS BE? Participants are housed in WPI first year student housing, which is typically triple occupancy. Frontiers staff will assign roommates; however, participants may request to live with a friend or acquaintance attending the program. Students are expected to live on campus for the duration of the program and may not bring a vehicle with them.

Students eat in WPI dining facilities for all meals on campus. Usually, breakfast is 7:30–8:30 a.m., lunch is 12:30–1:30 p.m., and dinner is around 5:30 p.m. every day. There is a wide variety of food selections daily, including vegan/vegetarian/kosher options, salad bar, hot entrees, etc. The dining staff is happy to accommodate any special needs/restrictions with advance notice.

WHAT TYPE OF SUPERVISION OF PARTICIPANTS IS PROVIDED? Participants are not allowed to leave campus unsupervised at any time. They must be in their residence hall by the 10:30 p.m. curfew. A nightly check-in with staff is required at that time. There are no co-ed floors in the residence halls. Frontiers PAs (program assistants) and WPI residential life staff live in the residence halls with the participants. The ratio of participants to counselor is approximately 12:1. A criminal background check is completed on all undergraduate student staff as well as faculty and WPI professional staff. WPI’s 24-hour campus police department provides a “Street Smarts” workshop for participants during orientation. 24-hour nursing care is available for participants. A walk-in nurse’s office operates between the hours of 8 a.m. and 10 p.m. After 10 p.m., nursing staff is on call. In the case of a medical emergency, WPI is within two miles of two major medical facilities.

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Areas of Study

**Biology**

**Biochemistry and Molecular Biology**

**Chemistry/Biochemistry**

**Computer Science**

**Engineering**

**Mathematics**

**Physics**

**Statistics**

**Computer Science and Business**

**Creative Writing**

**Dance**

**Film and Media Studies**

**Music**

**Theatre**

**Visual and Environmental Studies**

**Language**

**Religion**

**Workshops**

**Creative Learning Resource Center**

**Launch**

- DO YOU EVER WONDER HOW THINGS ARE MADE? Manufacturing engineers determine how many things are made—from the cell for your cell phone, to the wheels on your bike, to the robots used in automated factories. In this workshop, you will explore WPI’s state-of-the-art manufacturing laboratories as you learn about advanced automation techniques. You’ll work hands-on with various pieces of equipment, emphasizing safe manufacturing practices, to design and build components that will come together as a functional assembly by the end of the week.

- NEW! Additional fee of $95 applies toward this workshop as students will develop a manufactured skateboard they will take home.

**Interactive Media and Game Development**

**Robotics Engineering**

**Robot Design and Operation**

- COST OF THE 2015 LAUNCH RESIDENTIAL PROGRAM IS $895, which covers tuition, room cost, 3 meals a day (except dinner on Sunday and Friday), snacks, daytime and evening activities, and equipment. (Although participants don’t need to worry about personal expenses, the WPI food court and bookstore are accessible to both commuter and residential Launch students.)

**Launch FAQs**

**WHO ATTENDS LAUNCH?**

- Students who
  - want to explore diverse math, science, and engineering disciplines.
  - are interested in real-world problem solving.
  - want to spend time on a college campus with college faculty.

**HOW MANY STUDENTS ATTEND LAUNCH?**

- We anticipate approximately 160 participants overall, with a cap of no more than 20 students per area of study (the exception being Robotics, which can accept up to 30 students). Areas of study are filled on a rolling basis.

**WHEN WILL I KNOW IF I HAVE BEEN ACCEPTED TO THE PROGRAM?**

- Registration opens February 2, 2015. No application is necessary, however students MUST complete and submit a registration-form available at wpi.edu/launch and the full tuition/$95 commutes/ $895 residential in order to reserve a spot in the program. The program is first come first-served. We will contact students directly if their first choice is no longer available.

**FAQs For Commuter Students**

**WHAT ARE THE DROP OFF AND PICK UP PROCEDURES?**

- Students must be dropped off/picked up by a guardian/parent. For safety and security reasons, students may not arrive at or leave the program alone. Students may not walk to the program. Drop off is between 8 and 9 a.m., pick up is between 4 and 5 p.m. Exception on closing day: participants must be picked up by the close of the program at 4:00 p.m. Parents/guardians must sign their child in and out of the program.

**IS LUNCH PROVIDED?**

- Students will eat lunch in WPI dining facilities. There is a wide variety of food selections daily, including vegan/vegetarian/ kosher options, salad bar, hot entrees, etc. The dining staff is happy to accommodate any special needs/restrictions with advance notice.
A Typical Day at Frontiers...

7:30 a.m.  
Start your day with breakfast.

8:30 a.m.  
Head off to your first “class” of the day.

10:30 a.m.  
Immerse yourself in humanities and arts.

12:30 p.m.  
Time for lunch and some relaxation.

1:30 p.m.  
Conduct hands-on lab work and experiments.

5:00 p.m.  
Enjoy dinner at the dining hall with friends.

6:30 p.m.  
Participate in a variety of evening activities.

10:30 p.m.  
Return to residence halls for the night.

WEEKENDS
Join us for Frontiers Fest and fun activities.

Frontiers & Launch
Office of Admissions
Bartlett Center
100 Institute Road
Worcester, MA 01609-2280

508-831-5286
wpi.edu/+frontiers
wpi.edu/+launch