



Rutgers University Summer QuarkNet Program 2020

The Physics and Astronomy Department of Rutgers University is currently accepting applications from high school students to participate in the **10th Annual Summer Workshop on Particle Physics, Cosmology and Quantum Computing**. In this program, students will learn about the most important fundamental open questions being addressed in physics today. Students will gain first-hand knowledge of research in fundamental particle physics by analyzing actual data from the Large Hadron Collider at the CERN laboratory in Switzerland. Students will also get hands-on experience collecting cosmic ray data and designing and carrying out their own cosmic ray experiments using particle detectors. Students will also design a quantum algorithm and run it on an actual quantum computer. Participating students will be expected to prepare and give a presentation with a group of fellow students at the conclusion of the program.

Graduates from previous years have highly praised the program and have found it to be of great help in deciding on areas of study in college. Participation in this program also helps to demonstrate a strong interest in science when applying for college admission.

The program will consist of engaging activities, fun demonstrations, interesting guest lecturers, tours of different labs at Rutgers, one special trip, and opportunities to work with other highly motivated students from around New Jersey.

The program will require students to spend about 20 hours on pre-workshop preparation using materials and activities that will be provided.

The program will meet weekdays (Monday through Friday) for two weeks at Rutgers University, Piscataway Campus, from 9:00 AM to 3:00 PM each day from Monday, June 29, 2020 to Friday, July 10, 2020. There will not be a session on Friday, July 3rd.

This program is sponsored by QuarkNet, an outreach program of the US high energy physics community, supported in part by the National Science Foundation Office of High Energy Physics and the U.S. Department of Energy Office of Science. The program is also supported by the Physics and Astronomy Department of Rutgers University.

Application Deadline: April 10, 2020

The program is free for the students.



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Dates for 2020 Program: Monday, June 29, 2020 through Friday, July 10, 2020. The program will not meet on Friday, July 3rd.

Requirements to attend:

- 1) The program is limited to students who have successfully completed a course in Physics and have a strong interest in learning about the exciting world of fundamental physics.
- 2) Students must be able to arrange transportation to and from Rutgers each day and are responsible for either bringing lunch each day or purchasing lunch at the Rutgers Student Center.
- 3) Students must be available every day for the period of the program. (Under special circumstances absences with valid excuses will be permitted. This information must be included in the Parent/Guardian submission.)
- 4) Students must complete the application process and be accepted into the program.
- 5) ***Students will be notified of their acceptance status by May 10, 2020.***



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Application Process:

The process consists of the following steps.

A) Completion of an online form

Only online submissions by the students will be considered for acceptance. Among other items, in that form you will provide your email address, your parent or guardian's email address, and the email address of your school guidance counselor.

Look over all of the required information (below) before you begin the application form. You must fully complete the form in one session.

That form will require an email address.

Do not use your school email address because sometimes they become unavailable over the summer. ***Be sure to pick an email address that you will monitor.***

We ***will only be using this email address to provide notifications*** such as program acceptance. Once we send out initial acceptance status, you will have a short time (about 1 week) to respond, letting us know of your intent to attend the program. If you fail to respond to this email, you will be dropped from the program.

B) Essay describing why you want to attend the program. Prepare the essay in advance. Then cut and paste the text from the essay into the online application form.

C) Submission of Permission Slip by Parent or Guardian via email

Below there is a permission form for your parent/guardian to sign. That form should be scanned and attached to an email sent by your parent/guardian.

D) Letter of recommendation by your Physics teacher (Included in Submission E)

You must ask a physics teacher to provide you with a letter of recommendation. That letter, along with a copy of your school transcript, must be scanned and sent by your school guidance counselor.

E) Submission of Transcript information By Your Guidance Counselor via email

Below there is a form that must be submitted by your school guidance counselor.

Use the following URL to fill out the form: <https://forms.gle/XUtyvYuEn7Zop2f58>



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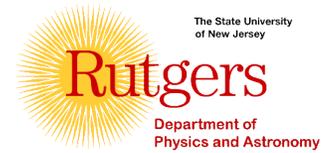
Information that you should collect to fill out the online form:

1. Your email address
2. Name and Home Address
3. Your age by July 2020
4. Your cell phone number (if you have one)
5. Your country of citizenship (we will visit a government facility for our field trip)
6. Parent/guardian name, phone, email address

7. High School District
8. Guidance counselor name and email address
9. Current year in High School
10. Highest Level Physics Class that you have taken
11. Grade in that Physics Class
12. Have you taken Electricity and Magnetism, and do you know what a Lorentz force is? (This will not be a disqualifier, but we need the information to prepare the program appropriately)
13. Highest Level Math Class that you have taken
14. Grade in that Math Class
15. Languages that you can program in

16. For each topic below you will be asked to describe whether you a) have learned about this in class, b) have read about this on your own, or c) have no familiarity. Note that inexperience with a given topic is not a disqualifier. We will use this information to structure the program.
 - a. Newton's Laws
 - b. Momentum and Collisions
 - c. Coulomb's Law
 - d. Ampere's Law and Faraday's Law
 - e. Lorentz Force
 - f. Special Relativity
 - g. Einstein's Mass-Energy Relationship
 - h. Atomic Theory of Matter
 - i. Quarks, Leptons, and the Standard Model

17. Essay: A one- to two-page essay addressing why you want to attend this program. You should copy and paste the essay from your PC into the form.



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Parent/Guardian Approval

Dates for 2020 Program: Monday, June 29, 2020 through Friday, July 10, 2020. The program will not meet on Friday, July 3rd.

Please fill in this page, scan it, and then include it in an email from the parent email address that was included on the online application form. The email should be addressed to: quarknet.rutgers@gmail.com.

The email should be titled: Quarknet: Student Name (where Student Name is the name of the student).

My child, _____ (print),
would like to attend this summer program at Rutgers University. I would like my child to attend this program.

I understand that this program is being run by Rutgers University in Piscataway, NJ. I understand that I will be responsible for arranging transportation to and from Rutgers for my student each day.

I understand that the expectation is that the student will be able to attend all 9 days of the program. Exceptions to this requirement will be considered. If that is required please add an additional page describing which days will be missed and the reason for missing those days.

Students will be responsible for either bringing lunch or purchasing lunch at the Rutgers cafeteria each day.

If there are any health issues that the program coordinators should know about, please list them here:

Name of Parent/Guardian (Print) _____

Home Phone: _____ Work Phone: _____

Parent Cell Phone: _____ Parent Email Address: _____

Signature of Parent/Guardian (Sign) _____ Date _____



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Guidance Counselor Certification Form

Instructions: All materials will be collected online. The form must be sent via the guidance counselor's email. We will use this email as signature verification of the guidance counselor.

Please provide an email that will include the following as scanned documents:

- a) This form
- b) A letter of recommendation from the Student's Physics Teacher
- c) A copy of the student's current transcript.

The email should be titled: Quarknet: Student Name (where Student Name is the name of the student). The email should be sent to quarknet.rutgers@gmail.com.

Student Name _____

Highest Level Physics course being taken or completed by this student: _____

Grade in this Physics course (or grade to date): _____

Highest Level Math course being taken or completed by this student: _____

Grade in this Physics course (or grade to date): _____

I am a guidance counselor for (school) _____.

I affirm that I have collected the information contained herein from the student and recommending teacher. I also affirm that the transcript information is valid.

Guidance Counselor Name (print) _____

Guidance Counselor Signature _____ Date _____