

Phys 494 – Course-based Undergraduate Research Experience in Relativistic Heavy Ion Physics

Instructor:

Dr. Christine Natrass

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Office hours: N/A

Teaching assistant: N/A

Class time & Location: MWF 1:00-1:50 Online

Course Description:

This course will incorporate undergraduates into a research project in high energy nuclear physics in a course setting. Each student will be responsible for implementing a heavy ion analysis in the program RIVET so that it can be used by the JETSCAPE collaboration to make comparisons between Monte Carlo models and data. Each student's project will be incorporated into a public software repository so that it is available to the field and, if possible, it will be validated by the relevant experiment and incorporated into the official RIVET software. Students will write a short paper summarizing their project and give a presentation open to members of the heavy ion physics community summarizing their work.

Textbook: N/A

Supplies: Each student will need access to a computer which can be used to log in to the [Advanced Computing Facility](#) and some device to enable [two-factor authentication to log in](#) (most cell phones will work). Students who do not have access to these personal resources should contact the instructor prior to the beginning of the semester to explore alternatives.

Campus Syllabus:

The campus syllabus applies to this class. You are encouraged to review the [campus syllabus](#).

Course Structure:

This course will have lecture and unstructured meeting time when students and the instructor can discuss and implement the projects.

Learning outcomes:

Students who successfully complete this course will:

1. Have experience working on a research project and make a meaningful and lasting contribution to scientific research
2. Get experience with reading scientific literature, presentations on technical subjects, and technical writing
3. Get experience with open-ended problem solving as part of a team
4. Understand the goals of heavy ion physics and how measurements of jets are used to constrain our understanding of the Quark Gluon Plasma
5. Have entry-level experience with the following tools: the Linux command line, git, C++, Latex,

Rivet

6. Submit work for inclusion in a public software repository.

Recommended Prerequisites:

Students should have either taken Computer Science 102 or had extensive programming experience and have passed at least one upper division physics class with a C or better. Exceptions to this will be considered on a case-by-case basis.

Format:

This class will be taught synchronously online in a flipped classroom format. Introductory lectures about the field are available online and class periods will be devoted to working on the project.

Course meeting times:

Students are generally expected to attend meetings and actively participate on a regular basis. Students should not sign up if they do not anticipate regular attendance.

Grade:

The grade is:

- 15% exam
- 70% project
- 10% online quizzes
- 5% in-class participation

The grading scale will be:

- 93.00% and above A
- 90.00% - 92.99% A-
- 87.00% - 89.99% B+
- 83.00% - 86.99% B
- 80.00% - 82.99% B-
- 77.00% - 79.99% C+
- 73.00% - 76.99% C
- 70.00% - 72.99% C-
- 67.00% - 69.99% D+
- 63.00% - 66.99% D
- 60.00% - 62.99% D-
- 59.99% and below F

Exam:

There will be one exam covering basics of the field. It is expected that most students should be able to do well on this exam if they have actively participated in the class and read the relevant material.

Project:

A project will consist of the implementation of an analysis in RIVET-HI, the creation of HEPData files if necessary, and the creation of data in the standard JETSCAPE format (50% of the course grade); a presentation summarizing the paper they are studying (10% of the course grade); and a paper on the work (10% of the course grade).

Course schedule:

A course schedule is posted on Canvas. This schedule is subject to change except for exam date and time.

Attendance policy and class participation:

Students are expected to attend course meetings. Class participation will be evaluated by whether or not the student has met the benchmark for the day.

If an absence is predictable in advance, the student should contact the instructor in advance by email and request that the absence be excused. If the absence could not be predicted in advance, the student should contact the instructor as soon as possible afterwards to request that the absence be excused. The instructor will reply to let the student know if the absence is excused. At the professor's discretion, doctor's notes, accident reports, police reports, and other relevant documentation may be required.

If class is canceled, it will be announced on Canvas or over the Slack channel.

Online quizzes:

Students are expected to complete assignments outside of class in order to prepare for the day's activities. Preparation will be enforced by quizzes administered over Canvas.

Discussion forum on Slack:

We will use Slack for discussions about implementing analyses. You are expected to monitor Slack throughout the week and help answer questions from other students.

Communication:

Emails to the instructor should have "Phys 494" in the subject. Students are expected to use their UTK email address for communication regarding the class and are expected to check their email regularly. You are very strongly encouraged not to disable emails from Canvas. Questions of general interest should be directed to the discussion forum, not made via private emails to the instructor. Only questions particular to an individual student should be made via private emails to the instructor. Questions of general interest made via a private email to the instructor may not be answered.

Academic honesty and expectations of clarity:

Students are expected to be familiar with Hill Topics and the academic integrity policies. Cases of academic dishonesty will be handled individually and the full range of sanctions allowed by university policy will be considered. Students are expected to report any suspected academic dishonesty to the instructor and *failure to do so is considered a violation of the student code of conduct*. Students are encouraged to work together and therefore expectations for this class are clarified in supplemental information available on Canvas. *When in doubt about how much group work is allowed, students are encouraged to ask for clarification in advance*. Students are responsible for making sure that their work meets expectations.