

Trinity Neutrino Observatory Syllabus

VIP6600, 6603, 3601, 3602,.2601, 4601, 4602, Variable Credits

Weekly Meetings on Tuesday, 3:30-4:30 pm, Howey N-110

Instructor Information

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General Course Information

Description

We want to build the world's leading instrument to detect petaelectronvolt (PeV) neutrinos from astrophysical objects. Neutrinos are neutral particles that are difficult to detect but carry a wealth of information about their sources. We pursue one of the most promising approaches to detect neutrinos of these extreme energies. The technique is described on our project homepage <https://trinity.physics.gatech.edu/>.

Because these instruments cannot be bought, we develop them ourselves. In this VIP, we seek to develop novel approaches to integrate photosensors (silicon photomultipliers), develop readout electronics, and the mechanical structure of the instrument. We also develop analysis and simulation tools for the data we will record with the Trinity instrument and for the data we have already recorded with the Trinity Demonstrator. The Demonstrator is a pathfinder instrument operated entirely by undergraduate students under the supervision of graduate students.

Pre- &/or Co-Requisites

There are no pre-requisites or co-requisites for this course.

Course Goals and Learning Outcomes

By the end of this course sequence, students will be able to:

1. **Design and implement digital and analog electronics** for the camera and readout of the Trinity One telescope.
2. **Remote Operate the Trinity Demonstrator.**
3. **Apply data-driven approaches** such as machine learning to analyze data and simulations.
4. **Design and prototype the mechanical structure of the Trinity One Telescope.**
5. **Understand how to work in large teams.**

Course Requirements & Grading

VIP teams function like real-world project teams. Members work on different aspects of a shared project, ranging from sophomores to graduate students, and from first-time participants to those with multiple

semesters of experience. Students may enroll for variable credit hours, which are considered in grading. **Note:** Zero-credit enrollment is reserved for paid participants and follows the same grading criteria.

Grading Overview

Each student is evaluated across three core areas, with three mandatory requirements. Regardless of role or experience, students must demonstrate achievement in all three areas:

1. Documentation and Records (33%)

- Maintain individual documentation (required).
- Contribute to team documentation: Trinity Wiki, Github, Dropbox

2. Personal Contributions (33%)

- Complete assigned quizzes, modules, essays, or reports.
- Engage actively in the project.
- Pursue knowledge relevant to the project.
- Contribute to technical progress.
- Experienced members may also contribute to project management.

3. Teamwork and Interaction (33%)

- Participate in peer evaluations. Failure to submit results in a full letter grade deduction.
- Attend meetings on time.
- Collaborate toward team goals.
- Coordinate and assist teammates.
- Contribute to team presentations.

Rubric

		Poor	Adequate	Spectacular (reflection in plum)	Points
Documentation (1/3 of total)					
Individual Documentation	Consistent to-do lists	Does not consistently create to-do lists. Difficult to track when work was done.	Leaves each meeting with work to do, with intended work easy to find in notebook or project management platform. Checks items off as work is completed.		2
	Explanation of what was done	Very little explanation of work and progress	Adequate explanation of work & progress Someone knowledgeable/ skilled in the field would be able to: • Understand decisions made • Repeat what was done • Obtain the same result	Same as previous + Includes reflections on what did/didn't go well, and next steps	3
Team Documentation	Documenting work, manuals, reports	Does not document work on project Wiki/github or does not write reports to document work	Work is documented for others to reproduce it		5
Contributions (1/3 of total)					
Attitude and approach		Uninterested in the project. Avoids work, waits for tasks to be assigned. Stops working when encounters obstacles, makes excuses.	Cares about the project. Proactively identifies or asks for tasks to do. Searches for solutions when encounters obstacles.	Same as previous + Has high standards for the team. Wants the team to succeed.	2

Quality of effort	Sloppy or incomplete performance on weekly work. Unprepared, late, or misses meetings.	Work is timely, complete, and accurate. Comes to meetings prepared.	Work quality exceeds what is expected. Looks ahead, identifies and explores next steps.	3
Learning	Unable or unwilling to develop knowledge or skills to contribute to the team.	Acquires knowledge or skills needed for the project.	Acquires knowledge or skills above/beyond the minimum needed for the project, to improve the team's performance.	2
Personal contributions to the project	Given the student's experience, course level, and number of credit hours...			
	Very few contributions. The work was too simple. The work did not advance the project or help the student gain skills that would advance the project.	Adequate contributions. The work advanced the project and/or helped the student gain skills needed to advance the project.	Same as previous + Exceptional contributions.	3
Teamwork (1/3 of total)				
Interaction	Interrupts or ignores teammates. Distracted during meetings (phone, email, etc.).	Avoids distractions during meetings and pays attention to others. Respects teammates' contributions, work, and ideas.	Same as previous + Shows an active interest in teammates' ideas and contributions.	2
Engages with others' work	Does not pay attention to teammates' progress.	Knows what everyone on the team (or subteam) is doing.	Makes sure teammates are making progress. Provides encouragement or enthusiasm to the team.	2
Communication	Does not share information. Takes actions that affect teammates without input.	Shares information with teammates. Communicates clearly.	Facilitates communication within team.	1
Giving help and feedback	Gives no help or advice.	Helps and gives advice when asked.	Offers help and advice. Gives constructive feedback.	1
Accepting help and feedback	Accepts no help or advice.	Respects and responds to feedback. Uses suggestions to improve.	Asks for feedback.	2
Completed Peer Evaluations*	Did not complete peer evaluations.	Completed peer evaluations by the program's posted deadline.		2

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Course Materials

Materials/Resources

Materials and resources will be provided

Course Website and Other Classroom Management Tools

We will use Canvas for peer evaluations and grading. For communication we will use Microsoft Teams and emails.

Peer evaluations are administered by the VIP Program [Click Here](#) to access peer-evaluations from off campus. [Click here](#) to access from on campus. You will be prompted to sign in. Users can only log in from

on campus or via [VPN](#). Students can only access the peer evaluation portion of the system during active evaluation periods.

Course Policies, Expectations, & Guidelines

VIP is a collaborative, multidisciplinary, project-based learning and research experience. Your success in this course depends not only on your technical contributions but also on your active engagement with your team and the broader learning process.

Your Role in the Learning Process

As a VIP student, you are expected to:

- Take initiative in exploring and applying knowledge relevant to your project.
- Collaborate effectively with team members across disciplines and experience levels.
- Document your work thoroughly.
- Reflect on your learning and contributions throughout the semester.

This course is a real-world team environment, where learning is dynamic, self-directed, and collaborative. Your growth depends on your willingness to engage, contribute, and learn from others.

Team Meetings and Participation

Attendance and active participation in **team meetings** and **sub-team meetings** are required. These meetings are essential for:

- Coordinating project tasks and timelines.
- Sharing progress and receiving feedback.
- Learning from peers and mentors.
- Contributing to team decisions and direction.

Failure to attend meetings without valid reason may negatively impact your grade and your team's progress. If you anticipate missing a meeting, communicate with your team and advisor in advance.

Use of External Resources

You are encouraged to consult external sources to support your learning and project work. However:

- **Do not present someone else's work as your own.**
- Always **cite and reference** external materials used in your notebook, code, presentations, or other deliverables.
- Proper attribution is essential to maintain transparency and integrity in a collaborative research environment.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. [Review Georgia Tech's Honor Code](#) and the [student Code of Conduct](#).

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Attendance and/or Participation

Team members must attend the weekly team meeting.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Not applicable

Inclement Weather and Digital Learning Days

Not applicable

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. [The Student-Faculty Expectations](#) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Student Use of Mobile Devices in the Classroom

Not applicable

Additional Course Policies

VIP Room and Equipment Use Policy

VIP rooms and equipment are shared resources used by multiple teams. To ensure a productive and respectful working environment, the following rules apply:

1. Room Usage Priorities

Room use is prioritized as follows:

1. Scheduled team meetings, lectures, and learning modules
2. Weekly sub-team meetings (multiple groups may share the space)
3. Video conferences or special meetings with VIP stakeholders
4. Other project-related work (multiple groups may share the space)

Room schedules are available on the VIP website.

Note: A “good neighbor” policy applies—students may use rooms during other activities as long as they do not cause disruption. Quiet individual work or studying is allowed when it does not interfere with scheduled uses. Similarly, multiple groups may use a VIP room at the same time.

2. Cleanliness and Conduct

- Everyone is responsible for keeping rooms clean.
- Food is allowed, but spills must be cleaned immediately.
- **Gum must be disposed of properly—do not stick it under desks or on carpets.**
- Rooms are monitored by cameras; violations may be reviewed via video.

3. Equipment Use

- Equipment may be designated for general use or assigned to specific teams.
 - General use examples: Projector in Klaus 1440, monitors in VL 465 and VL 463B.
 - Equipment assignments may change each semester.
- If unsure about equipment access, contact: vip-request@ece.gatech.edu
- Use equipment only for its intended purpose. Misuse may pose safety risks.

Important Equipment Rules:

- Equipment may not be removed from VIP rooms without a signed loan agreement approved by a VIP Director.
- You are financially responsible for any equipment not returned in good condition.
- You must know how to operate equipment safely. Approval to use equipment does not imply safety training has been provided.

4. Computer Accounts

- Accounts are for individual use only—do not share with others.
- All usage must comply with Georgia Tech, USG Board of Regents, and State of Georgia policies.
- Respect privacy and data integrity. Having access to a file does not mean you are authorized to read or modify it.

5. BuzzCard Access

- Access is a privilege and is logged.
- Rooms are under video surveillance. In cases of theft, vandalism, or messes, logs and footage will be reviewed.
- Do not allow unauthorized individuals into VIP spaces.
- Always secure the room (close the door) when leaving.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

A list of resources for undergraduate students' academic success and information about advising can be found at [Success at Tech](#).

- **1:1 Tutoring:** Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Georgia Institute of Technology has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit gatech.joinknack.com and sign in with your student account.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the [Office of Graduate and Postdoctoral Education](#) website. Specific information for [current graduate students](#) includes

- [Academic Resources](#) such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- [Student Resources](#) such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- [Professional Development](#) such as the programming from the Career Center and other professional development resources and events”]

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A [comprehensive list](#) of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide.gatech.edu)

Course Schedule

Week	Date	Activity/Event
Week 1	Week of Aug 24	Introductions Overview of team's work Discussion of semester goals ...
Week 2	Week of Aug 31	Sub-team selections finalized Sub-team meeting times finalized

Week 2-3	Sep 2 - Sep 8	Verification of Student Participation in class, due by Tuesday at 4pm
Week 3		Assignment: Self-grade VIP notebook with rubric
Week 8	Week of Oct 12	Web-based peer-evaluations released for students to complete. Online form due by end of the day Friday. Late submissions will not be accepted.
Week 7 or 8	Week of Oct 5 or Oct 12	Submit individual VIP documentation for mid-term grading.
Week 8	Week of Oct 12	Midterm presentations (if you do them)
Week 8	Oct 12	Midterm grades for 2000-level courses due in OSCAR (S for satisfactory, U for unsatisfactory).
	Oct 31	Withdrawal Deadline
Week preceding finals	Nov 30 - Dec 8 Open Close	Web-based peer-evaluations released for students to complete. Online form closes at 11:59PM on Tuesday. Late submissions will not be accepted.
Last week of class	Nov 30 - Dec 8	Final presentations Turn in individual VIP documentation for final grading.
Finals Week	Dec 10 - Dec 17	No final. No assignments.