Course Syllabus

VIP2601

Instructor: Prof. Krish Ahuja

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Graduate Research Assistants.

Class Meeting Location and Time
Guggenheim 244
5:00 pm – 5:50 pm

Office Hours & Location
As needed by appointment

Fall 2026 (Classes begin on August 24, 2026.)

Hypersonics VIP, Course Syllabus, and Grading Rubric

Vertically Integrated Projects Program • vip.gatech.edu

About Hypersonics VIP

The Vertically-Integrated Projects (VIP) Program operates in a research and development context. Undergraduate students that join VIP teams earn academic credit for their participation in design/discovery efforts that assist faculty and graduate students with research and development issues in their areas of expertise.

The teams are:

Multidisciplinary - drawing students from all disciplines on campus;

Vertically-integrated - maintaining a mix of sophomores through PhD students each semester;

Long-term - each undergraduate student may participate in a project for up to three years and each graduate student may participate for the duration of their graduate career.

The continuity, technical depth, and disciplinary breadth of these teams are intended to:

· Provide the time and context necessary for students to learn and practice many different professional skills, make substantial contributions to the project, and experience many different roles on a large, multidisciplinary VIP team.

· Support long-term interaction between the graduate and undergraduate students on the team. The graduate students mentor the undergraduates as they work on VIP projects

Student Teams

Students will for teams and will select team leader, preferably a graduate student or a senior. They may form sub teams if needed. Students are responsible for participating in their team and sub-team meetings. If you miss any meeting, you are responsible for knowing what occurred in that meeting, typically by discussing it with other team members. An excused absence does not relieve you of that responsibility.

embedded in the graduate students' research or the VIP class project

- Enable the completion of large-scale projects that are of significant benefit to faculty members' research programs.

Learning Objectives

Students will:

- Learn basics of the field of hypersonics.
- Make substantial contributions to the team project.
- Experience different roles of researchers in large research organizations working in multidisciplinary teams.

Instructor/Student Team Goals

1. Developing future leaders in the hypersonics workforce via meaningful research experiences,
2. Setting an example for the nation on how to effectively deploy talented and enthusiastic students to do cutting-edge research in hypersonics, and
3. Developing GT/GTRI research capabilities across various areas of hypersonics.
4. Publish conference and journal articles.

Syllabus

The scope of work will be broken down into the following four parts:

1. Design of a One-of-a-Kind Experimental Facility
2. Refinement of a Textbook (referred to a *Hypersonics for Dummies*)
3. Hypersonics-Related Lectures, both by the instructors and invited guests
4. For-Credit Research for Selected Students, which may require some time outside the class

Each of these is further detailed below:

1. **Design of a One-of-a-Kind Experimental Facility**

This semester's research will be oriented towards completing the design of a unique experimental facility to study "sonic fatigue" of structures subjected to extreme *aero-thermal-acoustic* loading. This means damage suffered by a structure simultaneously subjected to:

1. "Acoustic" loads involving extremely loud sound (both generated by the flow itself and by other sources such as propulsion systems)
2. "Thermal" loads caused by immense heat transmitted to the structure
3. "Aerodynamic" loads due to high-speed flow containing substantial unsteadiness (due to turbulence, oscillating shocks, etc.)

This combined loading is expected on advanced hypersonic vehicles. Initial efforts will focus on these three loadings in isolation.

Many VIP students laid the groundwork for this facility's design through research done during Spring 2025, Fall 2025, and Fall 2026 semesters, which included taking steps toward:

1. Generation of oscillating shocks in a turbulent flow
2. Measuring pressure fluctuations and using advanced techniques to understand their source
3. Using computational modeling tools to design a facility with a desired acoustic response
4. Development of advanced propulsion systems (which may act as a source of incredibly loud noise)
5. Developing a systems engineering approach to the sonic fatigue facility
6. Developing custom-made sources of very loud noise
7. Designing, in a preliminary fashion, a subsonic wind tunnel as a basic sonic fatigue facility

Additionally, experimental capabilities for generating high-speed, high-temperature flows exist at GTRI, which employ GT AE graduate students, which the VIP students will be able to visit . Limited capability of acoustic testing and jet testing also exists at campus for use by the VIP students.

Each student will own a piece of this major effort, but student contributions will take place in teams that are typically led by graduate students or more experienced senior undergrad students who have taken this VIP class in the past. There is a need for additional expertise to be developed in many areas.

Once the ball is rolling, it is expected that a short summary of each week's updates will be provided at the start of each meeting.

2. **Refinement of a Textbook (referred to a *Hypersonics for Dummies*)**

All students will review and edit parts of a textbook we have been referring to as *Hypersonics for Dummies*, which is intended to develop basic knowledge about all aspects of hypersonics. This began during the Spring 2025 semester. We will spend some time compiling all of the team's efforts into a central document visible to all.

3. **Hypersonics-Related Lectures**

For students' professional development, lectures covering relevant topics will be held. These lectures may be given by invited speakers, instructors, or experienced students.

4. **For-Credit Research for Selected Students**

Opportunities will be provided to selected students to work on their own for-credit research projects under the advice of Prof. Ahuja

Grading Rubric

A = meets expectations on **12 or 13 out of 13** standards listed below, and meets expectations denoted by (^{N}). Fulfilling the standards denoted by (^{N}) means you need 10 or 11 more standards to get an A.

B = meets expectations on ***10 or 11*** standards

C = meets expectations on ***8 or 9*** standards

D = met ***less than 8*** standards.

(In other words, if a standard appearing below with an asterisk is not met, the student will not earn an A.)

* Must meet expectation to earn "A."

Standard Met?	Area	Details
1.	**Individual and Team Effort Documentation as shown below (1/3 of grade)**	
	Individual Documentation in a notebook	
	*(*Maintain check-boxes for items to be done, with these to-do lists updated weekly.)	
___*	Consistent to-do lists and explanations of what was done	

		- Check-off and date items when done (progress/work completed can be tracked over time). - For meeting notes, include check-boxes for items for which you are responsible and deadlines for your sub team and the overall team. - The notebook must be a ***bound*** notebook, with a ***sewn*** or ***glued binding***, such as a ***composition book*** or ***lab notebook***. - Your name, your project's name, your contact info, and your team members' contact info must be recorded on the outer or inside cover.
___*	Met VIP notebook requirements	- Each page must be numbered, dated, and signed. Sufficient explanation of work, progress, and next steps. Someone knowledgeable/skilled in the field would be able to understand decisions made, repeat what was done, and obtain the same result. - VIP notebook will be of use to people who join the team later and need to refer to it. This includes legibility, intelligible technical and meeting notes, and overall organization.
___*	Scan of physical notebook uploaded to Canvas at the end of the semester	A legible digital scan of your notebooks should be provided at the end of the semester via an assignment on Canvas. Instructions will be provided late in the semester.
	Team-level documentation	
___	Contributions clearly denoted in team's "Hypersonics for Dummies" document to trace authorship	Any contributions to the Hypersonics for Dummies textbook should be clearly denoted in the document. If an individual wrote an entire chapter, this should be indicated. If a pair of students collaboratively wrote a section of a chapter, this should be indicated. *We may pursue publishing this work, and we must know who did what.*
___*	Contributions clearly denoted in team's documentation for	Any and all contributions for the Sonic Fatigue Facility need to be documented. This is to track progress on the facility and to ensure accountability amongst the teams.

	work on the Sonic Fatigue Facility	

2. Technical Contributions (1/3 of grade)

___	Quality of contributions	All submissions (e.g., homework, quizzes, presentations, other assignments) are ***timely***, thorough, and accurate.
___ *	Appropriate level of contribution to sonic fatigue facility design (or other assignment)	**Considering the course level and number of credit hours**, contributions to the project were appropriate. Contributions may include obtaining skills needed to do the work (This must be documented.)
___	Appropriate level of contribution to the team's "Hypersonics for Dummies" document	**Considering the course level and number of credit hours**, contributions to the "Hypersonics for Dummies" document were appropriate. Contributions may include conducting literature reviews and gaining an understanding of various topics – however, this effort should be documented in your VIP notebooks.
___*	Conception of one original idea	An original idea was conceived for a project, design, technology, etc. relevant to hypersonics, and clearly documented the idea in their VIP notebook by the end of the semester.

3. Teamwork (1/3 of grade)

___*	Attitude and participation	- ***Attends all class meetings*;** - Demonstrates interest in the project; - participates in discussions around others' work; - asks thoughtful, relevant questions; **and** - acknowledges the value of others' contributions.
___*	Engages with teammates' work	- Knows what others on the team/sub-team are doing;

		- treats teammates with respect; - gives teammates constructive feedback and suggestions; - helps or provides guidance to teammates; **and** - helps keep the team/sub-team moving forward.
___	Communicates well	- Communicates clearly and in a timely manner; - exchanges relevant information with teammates; **and** - facilitates communication within the team.
___	Proactive	- Identifies or asks for tasks to do and leaves each team meeting with tasks/work to be done; - suggests next steps; **and** - searches for solutions when obstacles arise – checks team documentation, searches online, reaches out to teammates, etc.

As part of the assessment of the above, each student is required to:

1. **<u>Maintain a VIP notebook.</u>** Scans of well-maintained VIP notebooks are available on the VIP website. **Each student must understand that if work is not documented in their VIP notebook, "Then you didn't do it,"** (i.e. work that is not documented in the notebook will not count toward your grade).
2. **<u>Complete the mid-term peer evaluation.</u>** This is a web-based form, and links are available on the VIP website. **Failure to complete the peer evaluation will result in a full letter grade deduction. Late submissions are not accepted.**
3. **<u>Complete the final peer evaluation.</u>** This will be available for one week during the week preceding finals. **Failure to complete the peer evaluation will result in a full letter grade deduction. Late submissions are not accepted.**

Performance Assessments

Performance assessments will be done once at mid-terms and again at the completion of the semester. The mid-term assessment is advisory and does not impact your final grades.

Final Exams

Final exams for the Fall 2026 semester are scheduled for December 10–17, 2026. Precise day and time will be announced separately. For the final, each sub-team will prepare a presentation describing the work they have accomplished over the course of the semester. Contributions

are ***expected*** from each student in the sub-team. The presentation session will take place in person, and all students are ***expected*** to attend.

Late Policy (Enforced as of 3/4/2026)

Assignments that are turned in after the posted due date on Canvas will be subject to a late penalty. 10% of the total grade for the assignment will be deducted for every day the assignment is not turned in. As an example, if a student turns something in 1 day after it's due, your maximum possible score will be a 90%.

Academic Honesty

The main principle in VIP academic honesty is that you will not present someone else's work as your own. Tests and specific assignments (homework, lab assignments, etc.) must be your own work. For other work you are encouraged to consult whatever sources are helpful in learning and understanding the issues associated with the material, but you should always provide appropriate references and citations where such material is included in your VIP notebook, programming code, presentations, etc.

Additionally, to provide a good working environment for all students, you're expected to adhere to rules given here, posted, or disseminated in class. Academic Honesty is taken seriously and failure to follow these principles will result in disciplinary actions as stated in the Student/Faculty Handbook.

Accommodations for Students with Disabilities

Georgia Tech offers accommodations to students with disabilities. If you need a classroom accommodation, please make an appointment with the Office of Disability Services (www.disabilityservices.gatech.eduLinks to an external site.). If you have an accommodation letter from ODS, please provide your team advisor with a copy of your accommodation letter and discuss with them how your accommodations will be applied. This should be done as early as possible in the semester.

Georgia Tech Honor Code

Students are expected to adhere to the Academic Honor Code at all times. The Honor Code can be found at https://policylibrary.gatech.edu/student-life/academic-honor-codeLinks to an external site..

Student-Faculty Expectations

Students and faculty are required to abide by the Student-Faculty Expectations Agreement. This can be found at https://catalog.gatech.edu/rules/21/Links to an external site..

Labs and Facilities

VIP has rooms and equipment that are shared by many VIP teams. In order to provide a good working environment, the following rules apply to anyone with access to these rooms and equipment:

1) The room priorities are:

1. Scheduled team meetings, lectures, and learning modules;
2. Weekly sub-team meetings (multiple groups can use rooms at same time);
3. Video conferences or special meetings with VIP stakeholders;
4. Other project-related work (multiple groups can use rooms at same time).

Room schedules can be viewed on the VIP website.

While the above priorities indicate which events take precedence, a good neighbor policy on using the rooms applies. If you need to access computers, equipment, or work on a project in the room while other activities are going on (sub-team meetings, etc.), you are welcome to do so as long as it does not disrupt a scheduled activity. Similarly, multiple groups may use a VIP room at the same time. Also, where it does not disrupt one of the above uses, VIP participants may use the rooms for other activities such as studying.

2) Everyone is expected to pitch in to keep the rooms clean. Food is allowed in the rooms provided any spills or messes are cleaned immediately. The rooms are monitored by camera, and staff will pull videos to identify offenders. Gum is a particular problem especially in carpeted rooms. Do not place used gum anyplace other than in a trash can.

3) The rooms have equipment both for general use and for specific teams. General use equipment includes the projector in Klaus 1440 and monitors in VL 465 ad VL 483B. Other equipment may be for general use or dedicated to a team specific purpose; some equipment may be general use one semester and assigned to a team another semester. If you are unsure of whether equipment is available for general use, contact VIP at vip@gatech.edu. You should only use equipment for the designated purpose. Some equipment may pose personal hazards if used inappropriately!

1. Equipment owned by the VIP Program may not be removed from a VIP room without completed an equipment loan agreement, which would need to be approved by one of the VIP Directors. To request permission, email vip@gatech.edu.
2. You will be responsible for the replacement cost of any equipment not returned in good condition.
3. You must be sure you know how to operate the equipment safely. Written approval to use the equipment does not indicate that the team advisor has reviewed equipment use and safety. You are responsible for knowing the hazards and safe operation of any equipment you use.

4) Computer accounts are issued for your use only. You may not share computer accounts with anyone else, even another team member. All computer usage is subject to rules and policies of Georgia Tech, the University System of Georgia Board of Regents, and the State of Georgia. Additionally, you are expected to be considerate of other users. Computer permissions are not authoritative. For example, just because you have file

access to something does not indicate that it is appropriate for you to read or modify that file.

5) Buzz-card access to VIP facilities is a privilege contingent on abiding by the above rules. Buzz-card access is logged, and rooms are video recorded. Be aware that if there is a problem (theft, vandalism, or simply a mess left in a room), the logs and video records will be consulted. Do not allow unknown people to access VIP facilities. Be sure to secure the facilities (i.e. close the door) when you leave.

6) The Hypersonics VIP has access to ESM G3 for conducting experiments on campus. All of the above rules (1-5) apply to this space as well.

Course Summary:

A Sample Course Summary from the past appears below. A similar summary will be provide at the start of the class. Something similar will be followed again.

Date	Details	Due
Fri Feb 13, 2026	Assignment Export Control Training and Github	due by 11:59pm
Wed Feb 18, 2026	Assignment Sonic Fatigue Facility Update Presentation 1	due by 4:30pm
Fri Feb 20, 2026	Assignment Export Control Training and Github (1 student)	due by 11:59pm
Fri Feb 27, 2026	Assignment GT Midterm Peer Evals	due by 3:30pm
Wed Mar 4, 2026	Assignment Sonic Fatigue Facility Update Presentation 2	due by 4:30pm
	Assignment Knowledge Check™ 1	due by 5pm

A Sample Course Summary from the past appears below. A similar summary will be provide at the start of the class. Something similar will be followed again.

Date	Details	Due
	Assignment Research Time™ 1	due by 11:59pm
Wed Mar 18, 2026	Assignment SFF War Room	due by 11:59pm
Wed Apr 22, 2026	Assignment Reflection Time™	due by 11:59pm
Fri May 1, 2026	Assignment Final Exam: Group Presentations	due by 11:59pm