

Automotive LiDAR Syllabus

Section VVO, Variable Credits

Thursday, 2:00 - 2:50pm, Klaus 1440

Instructor Information

Instructor	Email	Drop-in Hours & Location
Kevin Abraham (ECE)	Kevin.Abraham@gtri.gatech.edu	As needed on Slack
Co-Instructor(s)	Email	
Chase Johnston (ECE)	Chase.Johnston@gtri.gatech.edu	
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General Course Information

Description

This interdisciplinary, project-based course challenges students to engineer a **low-cost scanning LiDAR system** from the ground up and integrate it into a **fully autonomous RC vehicle-based testbed**. Students will work in collaborative teams to bridge the gap between hardware and software, focusing on the precision of laser-based sensing and the logic of autonomous navigation.

Pre- &/or Co-Requisites

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

Course Goals and Learning Outcomes

- **Hardware Integration:** Designing and assembling scanning mechanisms and integrating sensors with embedded systems (e.g., ESP32, Raspberry Pi, or Jetson Nano).
- **Perception & Mapping:** Developing algorithms to process LiDAR point clouds for obstacle detection and real-time environment mapping.
- **Autonomous Navigation:** Implementing control systems on an RC vehicle platform to achieve reliable, self-driven maneuvers.
- **Systems Engineering:** Managing the full lifecycle of a technical demo, from initial prototyping to a field-ready autonomous deployment.

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: GitLab, Google Drive

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

All grading is handled through Canvas. The gradebook view contains a breakdown of how each assignment contributes to the final grade. Each assignment description will include the rubric used for grading it.

Grading Scale

Your final grade will be rounded to the nearest whole number and 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

Course Website and Other Classroom Management Tools

This course utilizes **Canvas** for assignment tracking and grading. **Slack** (autolidar.slack.com) serves as our primary method of communication. We use **GitLab** (gitlab.com/autolidar) for software-related planning and source control, and **Google Drive** (tiny.cc/autolidar_drive) for all other data, designs, and documentation.

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 (or something) 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

Regular attendance is encouraged but not required, with the exception of Week 2, which is mandatory for Verification of Participation. You are responsible for all material covered in your absence. Unless you have provided prior notification, no special accommodations will be made for missed content.

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

Assignments are due on the dates indicated in Canvas, by the end of class (unless otherwise specified). **Late submissions will incur a 10% deduction per day.**

Please note the following exceptions:

- Peer Evaluations: Peer evaluations are handled through a centralized VIP system. As such, there are limitations on how late submissions can be accepted. These limitations are called out in the Semester Overview above, in the Canvas assignment, as well as on the VIP website (<https://vip.gatech.edu/peer-evaluations>).
- Extensions: If you are experiencing extenuating circumstances that prevent you from submitting an assignment on time, please contact us at least 24 hours before the due date to discuss a possible extension. Documentation may be required.

Inclement Weather and Digital Learning Days

Classes affected by university closures or weather events will be held virtually via Microsoft Teams at the standard class time. Please refer to Canvas for the meeting link. Recordings of these sessions will be made available for those who lose power or internet access.

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

As this course utilizes digital platforms like Slack, mobile devices are permitted as tools to support your learning. You are encouraged to use your device to participate in discussions, check real-time course updates, or reference documentation. However, please be respectful of the learning environment: keep devices on silent and refrain from using them for non-course-related activities.

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

Note: this is a high-level schedule. See Canvas for all assignment due dates.

Week	Date	Activity/Event
Week 1	Aug 27	Introductions Overview of team's work Discussion of semester goals ...
Week 2	Sep 3	Sub-team selections finalized Sub-team meeting times finalized Verification of Student Participation (in class)
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	Oct 8	Submit individual VIP documentation for mid-term grading.
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.