2D Heterostructure Synthesis VIP Syllabus (VIP 3602, 4602, 6600, 6602, 6603)

Thursdays 9:30am-10:20am Baker 101E (Or as otherwise stated)

Instructor Information

Instructor	Email
Brent Wagner	Brent.Wagner@gtri.gatech.edu
Eric Vogel	Evogel7@gatech.edu

Teaching Assistant(s)	Email
Emily Toph	etoph3@gatech.edu
Fanuel Mammo	fmammo3@gatech.edu

General Course Information

About 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 embedded in the graduate students' research.
- Enable the completion of large-scale projects that are of significant benefit to faculty members' research programs.

Team Focus

2D Heterostructure Synthesis is a project-based course where students investigate the synthesis and characterization of 2D materials, specifically indium selenide using molecular beam epitaxy. Students work in smaller sub teams, producing presentations reviewing the current scientific literature connecting to their experiences in hands-on laboratory sessions. Progress is tracked through VIP notebooks, which serve both as documentation and as the main tool for assessment, covering individual contributions and teamwork. Grading is based on thorough documentation, personal involvement, and collaboration. Along with technical work, students will regularly present their findings, complete VIP peer evaluations, and are expected to contribute to moving the overall research project forward in a collaborative environment. The

course emphasizes informal discussion, peer learning, and practical research experience, suitable for leadership development.

Course Goals and Learning Outcomes

Upon successful completion of this course, you should be able to…

- Understand the synthesis of indium selenide via molecular beam epitaxy.
- Analyze and interpret data from advanced material characterization tools including atomic force microscopy, Raman spectroscopy, and X-ray diffraction.
- Understand the materials science underlying the electronic and structural properties of semiconductors.
- Document your scientific process, progress, and findings in a well-organized notebook, demonstrating scientific record-keeping.
- Critically discuss and present recent literature related to molecular beam epitaxy, indium selenide, or related topics, communicating both orally and in writing.
- Collaborate productively in multidisciplinary teams, demonstrating reliability, initiative, and constructive peer engagement throughout all stages of the project.

Course Requirements & Grading

Description of Graded Components

Weekly presentations are not graded like regular homework; instead, your VIP notebook serves as the assessment tool documenting your progress, contributions, and collaboration for grading. Peer evaluations are required and participation in them is necessary to avoid a letter grade penalty, but the feedback itself is used to inform the instructor rather than being calculated directly into the grade.

The graded components of the 2D Heterostructure Synthesis course are divided into three main areas:

- Documentation (1/3 of final grade): This includes maintaining a detailed VIP notebook. Your notebook should comprehensively record your work, ideas, planning, meeting notes, reflections, and collaboration throughout the semester.
- Personal Contribution (1/3 of final grade): This measures your individual effort and initiative in advancing the team's research goals, such as participation in weekly literature readings and lab sessions, as well as your proactiveness in undertaking and completing assigned tasks.
- Teamwork (1/3 of final grade): This evaluates how well you work as part of your subteam, support your peers, communicate, and help move the group forward. Peer evaluations play a role by providing feedback on your participation, dependability, and cooperation within the team.

Notebook Maintenance	- 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. - Each page must be numbered, dated, and signed.
To-Do List Maintenance	- Maintain check-boxes for items to be done. - Check-off and date items when done.
Meeting Notes	- For meeting notes, include check-boxes for items for which you are responsible and deadlines for your sub team and the overall team.

Usability	- Will your VIP notebook 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.
Overall	- An overall rating of your notebook. (Detailed design notes, design decisions, copies of or pointers to code that you wrote, records of important websites, etc.)

Grading Rubric

	Poor (60-79 points)	Adequate (80-89 points)	Spectacular (90-100 points)	Points
Documentation (1/3 of total)				
Individual Notebook, Electronic Log, or Project Management Tool				
Consistent to-do lists (30%)	Does not consistently create to-do lists	To-do lists created each week Completed items checked off	Same as previous + Easy to understand + Items checked off **and dated**	
Explanation of what was done (40%)	Very little explanation of work and progress	Adequate explanation of work and 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	
Interactions (30%)	Very little explanation of interactions and meeting notes	Adequate explanation of interactions and meeting notes for each week	Same as previous + **Includes reflections** on meetings and interactions	
Contributions (1/3 of total)				
Attitude and Approach (15%)	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	
Quality of effort (25%)	Sloppy or incomplete performance on weekly tasks. 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.	
Learning (25%)	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	
Interaction (20%)	Interrupts or ignores teammates	Listens to teammates and respects their contributions	Asks for and shows an interest in teammates' ideas and contributions	
Personal contributions to the project (15%)	Given the student's experience, academic rank and number of credit hours...			
	Very few contributions The work was too simple The work did not advance the project or	Adequate contributions The work advanced the project and/or helped the student gain	Same as previous + **Exceptional** contributions	

	help the student gain skills that would advance the project	skills needed to advance the project		
Teamwork (1/3 of total)				
Engagement with Teammates' Work (25%)	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	
Communication (25%)	Does not share information Takes actions that affect teammates without input	Shares information with teammates Communicates clearly	Facilitates communication within team	
Giving help and feedback (25%)	Gives no help or advice	Helps and gives advice when asked	Offers help and advice Gives constructive feedback	
Accepting help and feedback (25%)	Accepts no help or advice	Respects and responds to feedback	Asks for feedback Uses suggestions to improve	

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%

According to policy, grades at Georgia Tech are interpreted as follows:

A	Excellent (4 quality points per credit hour)
B	Good (3 quality points per credit hour)
C	Satisfactory (2 quality points per credit hour)
D	Passing (1 quality point per credit hour)
F	Failure (0 quality points per credit hour)

Course Materials

Course Website and Other Classroom Management Tools

Microsoft Teams will be used for all course communication.

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

Students are encouraged to stay home when sick to take care of themselves and each other. The student is responsible for contacting peers to maintain their notebook entry for the missed class or lab section. Excused absences are granted by contacting the TA via email or Microsoft Teams prior to the absence.

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

Late work is not accepted unless it is an approved exception. Please contact Dr. Wagner.

Inclement Weather and Digital Learning Days

If a weather-related event affects campus operations, you will be informed if class is canceled.

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.

Additional Course Policies

- Wear appropriate clothing to lab sessions
  - Closed-toe shoes
  - Long pants or skirts
  - Tie back long hair
  - Avoid loose clothing or dangling jewelry

Campus Resources for Students

Undergraduate Student Academic Success Resources: For undergraduate courses, a sample statement that might be included in your syllabus for this section is "A list of resources for undergraduate students' academic success and information about advising can be found at Success at Tech.

- Academic Support: The Office of Learning and Academic Success Initiatives (a division of the Office of Undergraduate Education & Student Success, Academic Success & Advising) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources: For graduate courses, a sample statement that might be included in your syllabus for this section is "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)

More resources on supporting student well-being on the syllabus and beyond are available through the Learning Well Initiative.

Course Schedule

Lab session times TBD based on TA and student availability.

Lab notebooks will be collected for midterm and on the final day of instruction. The final lecture day is November 20th, 2025.

Week 1		Lecture Aug 27	Introductions and Overview
Week 2		Sep 3	Sub-teams finalized
Week 3	Student Led Presentations and Lab Sessions	Sep 10	
Week 4	Student Led Presentations and Lab Sessions	Sep 17	Assigned: Self-grade VIP notebooks with rubric
Week 5	Student Led Presentations and Lab Sessions	Sep 24	Due: Self-grade VIP notebooks with rubric
Week 6	Student Led Presentations and Lab Sessions	Oct 1	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	Student Led Presentations and Lab Sessions	Oct 8	Turn in VIP notebooks at team meeting for mid-term grading.
Week 8	Student Led Presentations and Lab Sessions	Oct 15	
Week 9	Student Led Presentations and Lab Sessions	Oct 22	
Week 10	Student Led Presentations and Lab Sessions	Oct 29	
Week 11	Student Led Presentations and Lab Sessions	Nov 5	
Week 12	Student Led Presentations and Lab Sessions	Nov 12	
Week 13	Student Led Presentations and Lab Sessions	Nov 19	
Week 14	Student Led Presentations and Lab Sessions	Nov 26 – No class	
Week 14	Student Led Presentations and Lab Sessions	Dec 3	Web-based peer-evaluations released for students to complete. Online form closes at 11:59PM on Tuesday. Late submissions will not be accepted Final presentations Turn in VIP notebooks at team meeting for final grading.
Finals Week	Dec 10 - Dec 17		No final exam. No assignments.

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:
    a. Scheduled team meetings, lectures, and learning modules;
    b. Weekly sub-team meetings (multiple groups can use rooms at same time);
    c. Video conferences or special meetings with VIP stakeholders;
    d. 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!
    a. 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.
    b. You will be responsible for the replacement cost of any equipment not returned in good condition.
    c. 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.