⟨Quantum | Engineering⟩ Syllabus

Section: VYC, Variable Credits

Wednesday: 6:30-7:20pm

Location: Callaway Manufacturing Research Center (GTMI) Room 114

Instructor Information

Instructor Dr. Yan Wang	**Email** yan-wang@gatech.edu	**Drop-in Hours & Location** By appointment
Co-Instructor Dr. Asif Khan	**Email** akhan40@gatech.edu	**Drop-in Hours & Location** By appointment
Ph.D. Student Mentor Jungin Kim	**Email** jkim3252@gatech.edu	**Drop-in Hours & Location** By appointment

General Course Information

Description

This interdisciplinary, project-based course provides students the opportunities to explore the state-of-the-art research topics in quantum information science and engineering. Quantum engineering is a new discipline that focuses on the realization of quantum technologies, such as quantum computing, quantum information science, quantum network, and quantum sensing. To realize the full potential of quantum technologies, we need to tackle the challenges of scalability, reliability, and integration of quantum devices and systems. The end goal of quantum engineering is to accelerate the maturity of quantum technologies for wide adoptions and deep benefits in the society.

Pre- &/or Co-Requisites

PHYS 3143 Quantum Mechanics I, or PHYS/MATH 4782 Quantum Information & Quantum Computing, or quantum-related research experiences

Course Goals and Learning Outcomes

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

1. **Gain deeper knowledge** of specific software or hardware aspects of quantum technologies as well as **appreciate the broad and interdisciplinary nature** of quantum engineering.
2. **Gain the research skills** of literature review, problem formulation, problem solving, as well as technical writing and presentation.
3. **Gain life-long learning skills** of knowledge collection, integration, and creation.

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%)**

- VIP Notebook; (10%)
- VIP Wiki documentation on Canvas; (23%)

2. **Personal Contributions (34%)**
   - Midterm presentation slides; (5%)
   - Final presentation slides; (5%)
   - Final Project Report; Software Code; (24%)
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

VIP notebook will be graded based on whether it is ***organized for each week***.

The Wiki project proposal, presentations, and project report will be graded based on the criteria that whether assumptions are ***sound*** and ***reasonable***, methodology is ***novel***, and results are ***accurate***, the presentation/report is ***organized***, and English writing is ***error-free***.

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

IBM Qiskit (https://www.ibm.com/quantum/qiskit)

PennyLane (https://pennylane.ai)

Course Website and Other Classroom Management Tools

Canvas is the main platform for course content sharing and assignment submissions. Students are also encouraged to use GitHub for collaboration and code sharing. Project teams can set up own collaboration and communication platforms (e.g. Slack, Basecamp, Asana, etc.) as the supplementary to Canvas' forum discussion and zoom meeting tools.

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.
- You are encouraged to use **Generative AI tools** to learn subjects. However, generating assignments (reports, code) with the tools directly for submissions without own contributions is strictly prohibited. This is regarded as the violation of academic integrity rules.

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 Participation

Students are required to attend each week's class session in-person and participate in group discussions. Students are expected to actively engage with other team members for research study and project deliverables outside class session.

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

Late assignments will not be accepted. Mid-term and final presentations are oral examinations. All team members are required to participate in presentations in-person.

Inclement Weather and Digital Learning Days

Participation of class session remotely over digital platforms is not permitted, unless Georgia Tech officially announces Digital Learning Days due to inclement weather.

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

The use of mobile or digital devices to record audio or video during class discussions or presentations is prohibited.

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	8/26	Introductions Overview of team's work Discussion of semester goals
Week 2	9/2	Sub-team selections finalized Sub-team meeting times finalized
Week 3	9/9	**VIP notebook due**. Verification of Student Participation in Class Due by Friday at 4pm
Week 4	9/16	**VIP wiki page on Canvas due**. Due by Friday at 4pm Canvas → "Pages"
Week 7	**10/7**	**Midterm presentations.** Presentation Slides due by presentation day at 6:30pm **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 8	*(Oct. 12)*	*Midterm grades for 2000-level courses due in OSCAR (S for satisfactory, U for unsatisfactory).*
Week 11	*(Nov. 2)*	*Withdrawal Deadline*
Week 15 (Last week of VIP class)	**12/2**	**Final presentations** Final Report, Slides, Code due by Friday at 11:59pm.
Week preceding finals	Dec. 1 <-> Dec. 9 *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.
Finals Week	*(Dec. 10 – Dec. 17)*	*No final. No assignments.*