BIOE 451/2 Bioengineering Design I and II
GLHT 451/2 Global Health Technologies Design I and II

INSTRUCTORS
For specific questions about the course or grading as it pertains to any individual student – the instructor for the course the student is registered for should be consulted first and has the final decision-making authority.

BIOE451/2
Dr. Sabia Abidi
Office Hours: Ryon Lab B24, by appointment only (please email)
Email: sza2@rice.edu

GLHT451/2
Dr. Kiara Lee
Office Hours: Rm. 917 BioScience Research Collaborative (BRC), by appointment only (please email)
Email: kl162@rice.edu

OEDK SUPPORT STAFF

Design Coordinator:	Sondra Hernandez
Senior Engineering Design Technician:	Fernando Cruz
Engineering Design Technician:	Karl Ehlers
Engineering Design Technician:	Robert Legans-Johnson
Administrative Coordinator:	Michaela Calhoun
Assistant Director of Administrative Operations:	Marilee Dizon
Accounting Specialist:	Sukaina Ahmed

Director of Strategic Initiatives and International Programs: Amy Kavalewitz

COURSE INFORMATION

Meeting Time/Location: 8:30-9:50 am MWF, in person unless otherwise stated (check lecture schedule for locations; weekly meetings will be held at team tables in OEDK)

Key Resource for Information: OEDK website: http://oedk.rice.edu
Course Canvas site, Google Drive as needed

Course Textbook(s): (BOTH OPTIONAL FOR STUDENTS: Source of some lecture materials, useful for teams)
Product Design and Development
Karl T. Ulrich and Steven D. Eppinger
Fifth edition, 2011; McGraw-Hill

Some excerpts from:

Biodesign: The Process of Innovating Medical Technologies
Paul Yock, Stefanos A. Zenios and Todd J. Brinton
2nd edition, 2015; Cambridge University Press

Course Summary and Objectives:

Unlike other classes you may have taken, there is not a single book/concept area/set of equations that you need to master to succeed in class. Many topics, tools and ideas will be presented and you will have to combine those with your engineering knowledge and undergo the process of engineering design for an end product that's useful. You are expected to WORK HARD, FIND YOUR OWN RESOURCES, ENGAGE IN EFFECTIVE TEAMWORK, BE CREATIVE, BE ANALYTICAL and BE AN INDEPENDENT ENGINEER to succeed in this class. ***This course will be a challenging one but we are here to support you throughout the process.*** As a note, you MUST take both semesters of this course in sequence during the same academic year.

A design and analysis project will be scheduled for the duration of both semesters. The process of developing and building the design project within teams is the primary focus of the course.

A student's responsibilities in this course may be divided into 3 areas:

1) Lectures and workshops on important topics in design
2) Design process itself
3) Documentation of the design

Lectures and workshops will occupy about 3 hours/week. Each student should expect to devote an average of at least 10 hours/week for the Fall Semester **in addition** to attending lectures and/or workshops.

Detailed descriptions of the required deliverables will be provided via Canvas. Briefly, these include:

- Meetings of the team with faculty advisor for part of year
- Electronic documentation of all course deliverables (via Google Drive uploads)
- Oral presentations (both semesters)
- Functional prototype that has been tested against design criteria
- Presentation of team's prototype at Undergraduate Engineering Design Showcase

At the end of the course, students will have attained experience taking a project from the initial problem definition to a working prototype, following the steps of the engineering design process.

Please note:

BIOE, MECH & ELEC students in the GLHT minor – In order to meet the requirements of the GLHT minor, you must participate in a global health related design project.

GLHT451/2 students – There may be some modification in the overall course schedule for GLHT 451 students. These will be clearly noted for you by Dr. Lee. You may work on teams with GLHT451 students or with other engineering students depending on the nature of the project.

Course Assignments:

Pre-Class Preparation. Due to the limited lectures allocated, several pre-class videos may be required to watch before scheduled lectures. In-class activities will be based on what you have learned from these videos. In addition, it is always helpful to read the material in the book as much more is covered in the text than will be covered in lecture. Occasionally, students will be asked to prepare material prior to class for use in their team sessions. In such cases, a printed copy of the preparation *will be due at the beginning of class lecture (8:30 a.m.) on the day it is due.*

Homework. No late homework will be accepted without permission of the instructor **before** the homework is due. Illness and family emergencies will be dealt with on an individual basis.

Exams. There will be no final exam, but there will be a final presentation during final exam periods in each semester.

Projects. Students will complete a design and analysis project that will run for both semesters. The process of developing and building the design project is the primary focus of the course. The project's topic options will be described in the first week of class. Students will be divided into teams. Some of the homework assignments will be designed to help students with their design project. During the year, teams will complete various oral and written communication assignments as described in the course schedule posted on Canvas online.

Assessments/Surveys. Students are required to fill out the CATME online peer evaluation survey twice in each semester. Failure to fill out the CATME evaluation (including the free-response sections) will result in an individual-grade reduction as described below. Students are also encouraged to participate in an online research survey being conducted by the Psychology Dept. Students will be able to opt-out of the survey with no penalty. Students will also be required to fill out an end-of-year survey according to the requirements of their departments.

Team-team exchanges. Student teams will be assigned another peer team/group of peer teams that share a project with similar technical challenges. Teams will be required to meet once with the other team(s) during each semester. During these meetings, teams will present a brief update of project progress to one another and have the opportunity to receive team-team feedback on project designs. This is an opportunity for teams to lean on the knowledge and expertise of their peers at critical design stages during project development. Teams will be required to keep track of meetings in weekly updates. Students will be asked to submit end of semester surveys to assess the value of these exchanges. Failure to attend and contribute to these meetings will lead to a grade penalty.

Grading Policy. The final grade will be based on the following:

Team project grade -- 100 %.
Each team member by default receives the team's score as a baseline.
Items contributing to team score (see Canvas site online, subject to change and varying somewhat depending on whether the team is mentored by BIOE, GLHT, MECH, or ELEC faculty):

	Semester 1	**Semester 2**
Oral Presentations	~11%	~9%
Design Execution/Prototypes	~44%	~59%
Written Documentation	~44%	~31%

Individual grades are adjusted up & down based on individual performance. Factors affecting individual grades:

- Attendance in class (see below)
- Attendance and participation in team meetings as assessed by course professor
- Contribution to team as assessed in CATME peer evaluations and by course professor
- Contributions to team-team monthly meetings as assessed by team members
- Completion of Canvas modules/assignments (individual/team)

Attendance at all lectures is expected from all students- The policy for how attendance will affect your grade is as follows:

- Students may miss 2 classes per semester for any reason and will NOT be penalized
- Students who have job interviews, medical school or graduate school interviews will have those absences count as ½ of an absence **after 5 (you are allowed 5 without deduction).** However, these must **ALL** be cleared with the instructor **at least 2 days** AHEAD of time. **Failure to do so will result in the absence counting as unexcused.**
- Arriving **more than 10 min** late to class will count as ½ absence.
- Extended illness that will keep you out of class for more than 2 days will be dealt with on a case by case basis with the instructor.
- After the first 2 absences, your grade is reduced 2.5% per absence for the next 2 absences and then 5% per absence after that.
- Attendance will be recorded in all instructor meetings.
- It is considered an honor code violation to sign in another student for attendance or to have a student sign you in to this class. The trouble that would come from this behavior is not worth it for EITHER student.

Policies. Class attendance is **essential**. There are no exams. You are expected to complete any assigned pre-class assignments before class, understand the material presented and apply it to your design project. This is not possible without consistent class attendance. There are many weeks during the 2nd semester where there is no lecture scheduled. This is to allow more time to complete your design projects.

Any disputes over grading on the homework or reports should be brought to the instructor in writing. Do not take questions related to grading to the Design Mentors, first approach the instructor. If the dispute involves other than an arithmetic error in your score, the entire report

or homework can be re-graded. Re-grading may result in a net loss of points. Submit the original, unaltered, homework or report along with a written description of the potential error. If a classmate's report or homework is being submitted as documentation of the grading error, it is also subject to possible re-grading. ***Late homework will generally not be accepted except in the case of illness or serious emergency. Contact the instructor before the due date to arrange an acceptable due date. Illnesses and emergencies should be documented with an appropriate excuse.***

General Expectations of Conduct with Respect to Course Materials, Supplies and Peer and Staff Assistance (AKA – OEDK Citizenship 101). OEDK general supplies are available for use by all teams. It is expected that teams will use what they need and not hoard supplies that others can use. If a part or supply is purchased specifically for a team, other teams must ask and get permission to use them for their own project. However, we expect a spirit of collaboration and help for each other. This means that we expect teams to be willing to help each other out with parts and supplies if possible. Remember, all supplies purchased for your project are actually owned by Rice.

Equipment that has been checked out to a particular team is their responsibility and property for the duration of their check-out period. You are expected to check out your own materials and not remove them from another team's table. If it is an emergency… and you use another team's tool- RETURN IT! Better yet check out your own! Open tools should always be returned to their proper location but may be used by any team if they are found on another team's table.

Honor Code Policy. The Rice Honor Code including prohibitions on plagiarism is in effect for this course. Students are encouraged to talk to each other, to teaching assistants, to instructors or to anyone else about an aspect of the course that is not specifically designated as pledged. For the entire academic year – signing in another student or having a student sign you into class is considered an honor code violation. If you are unfamiliar with the details of the Rice Honor code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. Plagiarism (including submission of output from chatGPT and other AI systems as your own), false citation, false data, and any other type of academic fraud will not be tolerated.

Diversity and Accessibility Statement. Rice University values equity, diversity, and inclusion. We are committed to a climate of mutual respect and full participation. Our goal is to create learning environments that are usable, equitable, inclusive, and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion, accurate assessment or achievement, please notify the instructor within the first two weeks of the course so that we can discuss options. Students with disabilities are also encouraged to contact the Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to discuss a range of options to removing barriers in the course, including accommodations. We also encourage you to make sure your documentation is on file with the Disability Resource Center.

Design Mentors. This year Design Mentors will be taking an active role providing continuous feedback throughout the year. In addition to weekly team-instructor meetings, you will be asked to meet with your Design Mentor weekly (without instructors present) to review progress. *Use this time to practice presentations, brainstorm new ideas, discuss conflicts or talk through possible approaches.* In addition to team meetings, Design Mentors will attend all oral presentations and participate in grading "big ticket" items throughout the year. Each team will be assigned one Design Mentor for the duration of the year. A list of Design Mentors for the 2024-25 year is included below:

Student Well-Being Statement
The instructors urge you to prioritize your own health and well-being throughout this course and your time at Rice University. If you are navigating personal, emotional, physical, financial, mental, or academic challenges, please reach out to the instructors and/or pursue other resources, such as the Wellbeing & Counseling Center, Student Health Services, and the Dean of Undergraduates Emergency Funding.

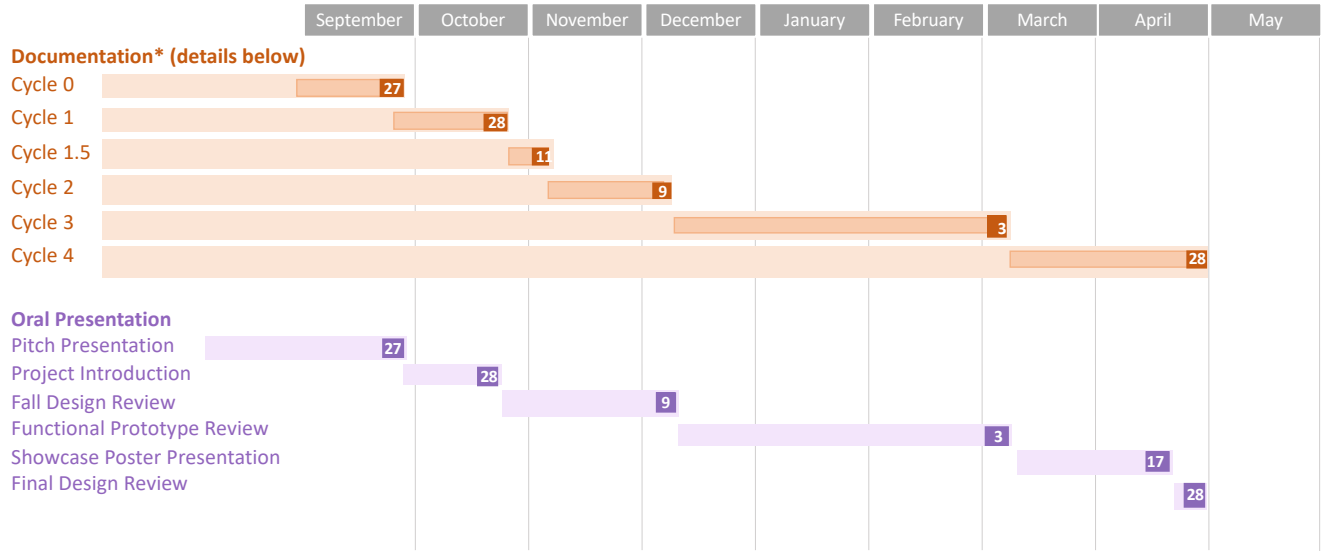
Attendance
We will ensure all instructional material is available via Canvas, Zoom or Google Drive for all students. Students will be expected to attend class synchronously. If you cannot attend class due to health, please let the instructor team know at your earliest convenience via email.

Participation
We expect all students to be actively engaged in the "classroom." For Zoom calls, students should keep cameras on and microphones muted when not speaking.

Instructor Contingency Plan
Since these courses are co-taught between Dr. Abidi and Dr. Lee, if one faculty member falls ill, the other will take on full responsibility of the other for lectures, team meetings and/or grading until the ill individual is able to return to class. Some responsibilities may also be shared among design mentors.

Changes to Syllabus. Material in this syllabus is subject to change if announced via email/Canvas to course participants.

Cycle and Oral Presentation Deliverable Schedule:



Due dates are represented by numbers within chart. Shaded orange boxes under the documentation section represents cycles.

Documentation Deliverables At A Glance (See Canvas Syllabus for Detailed Listing of Deliverables)

Cycle	Process Step	Documentation Deliverables
0	Problem Identification and Analysis	Design Context Analysis (Market Analysis, User Needs, Design Specifications), Mission Statement, FOSS Goals, Team Contract
1	Concept Generation	Design Strategy (Problem Decomposition), FOSS II Goals, Documentation Management, Project Management and Gantt Chart, Minutes and Agenda, Cycle 0 Revisions
1.5	Preliminary Goal Assessment	Cycle 2 Objectives
2	Prototyping and Documentation	Cycle 3 Objectives, Testing Plan, Standards and Regulations, Cycle 0/1 Revisions, IRB Information, FMEA
3	Prototyping and Functional Integrated Prototype Completion	Cycle 4/5 Objectives, Engineering Drawings, Invention Disclosure, Cycle 2 Revisions, Final Design
4	Testing, Documentation and Prototype Refinement	Bill of Materials, Assembly Instructions, LBM, Final Report, Document Revisions, Team Video

Fall Lecture Schedule:

Week	Lectures	Date	Location	Common Lecture Among All Capstone	Topic	Lecturer
1	1	8/26/24	OES130		Introduction to Capstone	Abidi/Lee
2	--	*8/26/24*	*OEDK*		*OEDK Tour for students that have not worked in OEDK*	*NA*
2	2	**9/4/24**	**Sewall 301**	*	Designing Effective Teams, **Team reveal**	All
2	3	9/6/24	OES130		Healthcare Disparities	Abidi/Lee
3	4	9/9/24	OES130		Engineering Design Process	Abidi/Lee
3	--	Canvas video	--		Documentation Review/Project Mgmt	Abidi/RCEL?
3	5	**9/11/24**	**Sewall 301**	*	Evaluating the Market	Judah/Panahi
3	6	9/13/24	OES130		Concept Identification and Selection	Abidi/Lee
3	6	9/13/24	OES130		Pitch FOSS Logistics	Abidi/Lee
CYCLE 0 DUE - 9/27						
6	7	9/30/24	OES130		Nuts and Bolts of Low Fidelity Prototyping	Wettergreen
6	8	**10/2/24**	**Sewall 301**	*	Human Factors	Kortum
CYCLE 1 DUE - 10/28						
10	9	Canvas video	--		Writing Objectives and Testing Plans	Abidi
12	10	**11/6/24**	**Sewall 301**	*	FMEA/Engineering Stds	Black
CYCLE 1.5 DUE - 11/11 CYCLE 2 DUE - 12/9						

** Spring Lecture Schedule will be shared once final dates are confirmed.*