WHAT MAKES A HOPKINS ENGINEER?

The elements of the Hopkins Engineering undergraduate experience

SPRING 2025

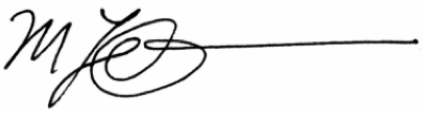
Reinventing Engineering for the Next 150 Years

THE INNOVATIONS to undergraduate engineering education being undertaken by the Whiting School of Engineering as our university enters its 150th year are bold. They reconsider the interrelation of learning, mentorship, empowerment, citizenship, and the coming-of-age process. They commit us to prepare our students to succeed in a world where artificial intelligence renders technical excellence married to creativity essential for leadership. Our driving vision is engineering education that is dynamic, accessible, inclusive, and humane. As engineering develops capacities to repair genetic codes, imbue machines with ethical intelligence, generate energy sustainably, and heal ecosystems, the promise and challenge of our educational systems have never been more existential.

The Second Commission on Undergraduate Education was convened by Johns Hopkins University in 2017 "to develop a new model for undergraduate education that instantiates our mission and will serve us for the next decade or more. In particular, ... to encourage and support students to make their education their own, [and]... to create a holistic curricular, co-curricular and extra-curricular experience that encourages such exploration..." The commission delivered its final report in 2020. The Whiting School of Engineering (WSE) established its own committees to develop an implementation plan to realize the commission's aspirations.

In the fall of 2018, two years before the commission issued its final recommendations, the undergraduate academic affairs leadership in WSE, Krieger School of Arts and Sciences, and Peabody Conservatory engaged in the Excellence in Academic Advising (EAA) strategic planning process in consultation with the National Academic Advising Association NACADA[1] and the Gardner Institute.[2] To respond to the commission recommendation that "each Hopkins undergraduate be provided an integrated team of a faculty mentor, an academic advisor, and a life design coach," WSE leveraged the rigorous EAA process to develop its strategic plan for undergraduate academic support.

The vision for undergraduate engineering education formulated here is the sustained work of at least 48 WSE faculty members and our administrative leadership in academic affairs, advising, and mentoring over a period of 18 months and reflect their dedication to our students, our institution and the future of the engineering enterprise.



Michael Falk, Vice Dean for Undergraduate Education,
Whiting School of Engineering,
Johns Hopkins University

[1] https://nacada.ksu.edu/
[2] https://www.jngi.org/
[3] https://advising.jhu.edu/excellence-in-academic-advising

What Makes a **Hopkins Engineer?**

Build Your Academic Foundation

First-year seminars and the **design cornerstone**

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Join a Caring Intellectual Community

Your **faculty mentor**

Supportive **academic advising, success coaching** and **life design**

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Building Blocks of the **Hopkins Engineering Experience**

Customized Academic Learning
Opportunities for learning beyond the classroom that are mentored and assessed by faculty including research, independent study, and for-credit internships.

Design Cornerstone
An experience offered to first year engineering students exploring how multidisciplinary engineering design engages teams to solve problems.

ePortfolio
A collection of digital artifacts students use to document foundational ability proficiencies, reflect upon their academic journey. and showcase accomplishments.

Faculty Mentor
A mentor assigned to each Hopkins Engineering undergraduate with whom they meet regularly to discuss their academic journey and professional aspirations.

First-Year Seminars
Courses that invite students into the intellectual life of the university through scholarly inquiry, critical thought, and engaged discussion.

Foundational Abilities
Six cross-cutting academic skills that lay the groundwork for deep thinking, engaged citizenship, and effective leadership.

Hopkins Semester
An optional junior or senior year, semester-long, faculty-mentored immersive experience rigorously exploring one complex subject or endeavor.

Life Design Educator
Professionals who connect students to career and industry experiences as well as relationships beyond Hopkins that facilitate professional and personal growth.

Life Project
An endeavor reflective of a person's passions, values, and aspirations that helps them to craft their academic journey and career path.

Reflective Practice
The process of reviewing current and prior experiences to garner lessons, identify areas of desired growth, and plan one's future direction.

Professional Academic Advisor
A professional advisor with whom students meet each semester to help with course selection, academic goal-setting, university policy, and degree completion.

Success Coach
A professional academic advisor dedicated to working with first-generation and limited income students to support their navigation of the university experience.

Build Your Academic Foundation

First-year Seminars and the Design Cornerstone

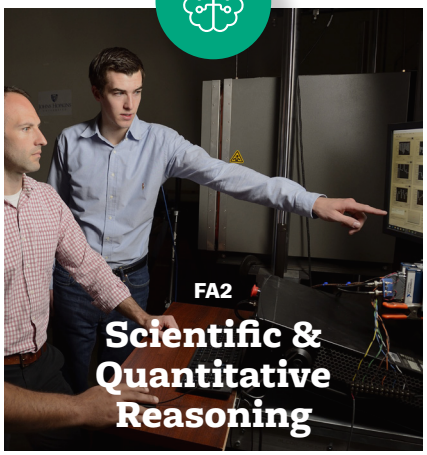
First-year seminars and the design cornerstone welcome engineering students to the intellectual life of the university and introduce them to the traditions of academic inquiry unique to Hopkins. Guided by a faculty expert, students enter "discover mode" by pursuing their curiosity in a small learning community exploring the cutting-edge developments.

First-year seminar courses lay a foundation of scholarly, creative thought that Whiting students will build on throughout their academic career. Although the topics of seminars can range widely—students can take courses in everything from evolving linguistic habits or the politics of utopias to the history of computing and divergent futures imagined by science fiction—all first-year seminar courses emphasize critical thought, rigorous reading, generative debate, and faculty-led discussion. Many first-year seminars include experiential learning components such as museum visits, guest speakers, film screenings, meals, and opportunities to connect course themes with the city of Baltimore.

Design Cornerstone invites students to discover how multidisciplinary engineering design engages teams to solve problems. This hands-on, project-based course gives students the opportunity to practice contextualizing and analyzing user needs. Students define design problems, plan and complete experiments, manage projects, and build prototypes utilizing the Whiting School of Engineering's Makerspace. In the process, students develop their skills for creative analysis and problem solving in the real world. The course is taught by engineering design experts.

Foundational Abilities

The six Foundational Abilities ensure that a Hopkins engineering education provides breadth as well as depth. Students develop their Foundational Abilities through courses and proficiency assessment within their ePortfolios.



FA1

Writing & Communication

Students should recognize the importance of language and have a command of it as readers, writers, and speakers.

LEARNING OBJECTIVES

- Demonstrate the ability to communicate effectively in different modes including written and oral forms.
- Demonstrate the ability to adapt to varied audiences and purposes.
- Demonstrate the ability to understand and interpret the communications of others.

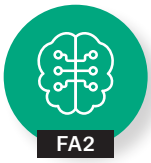
course requirements

- 3 credit writing course
- 3 credit oral communication course

ePortfolio assessment

Required:

- 1 writing sample and 1 oral communication sample from engineering coursework, research, or independent study



FA2

Scientific & Quantitative Reasoning

Students should develop facility with scientific, numerical, and algorithmic reasoning and be able to use computational and analytical methods.

LEARNING OBJECTIVES

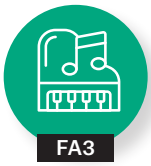
- Demonstrate the ability to reason scientifically and quantitatively.
- Demonstrate the ability to both construct and evaluate arguments and hypotheses as supported by data, sound theory, and evidence.

course requirements

- Calculus I (4 credits)
- Calculus II (4 credits)
- Probability and Statistics (4–8 credits)
- Computing/Data Science (3–4 credits)
- Introductory Physics, Chemistry or Biology with Laboratory (4–5 credits)

ePortfolio assessment

Encouraged but not required



FA3

Creative Expression

Students should recognize the importance of complex creative expressions and cultivate their intellectual and emotional responses to aesthetic and cultural experiences.

LEARNING OBJECTIVES

- Demonstrate the ability to interpret complex creative expressions, in some cases by undertaking such endeavors themselves.
- Demonstrate the ability to articulate the cultural, historical, and contemporary contexts of these works along with their social and cultural implications.

course requirements

- 12 credits of coursework, in FA3 and FA4 combined, with at least 3 credits in FA3
- For BA degree, 3 of the 12 credits must be 300-level or above

ePortfolio assessment

Not required unless applying research or independent study to FA3 credit requirement

FA4

Engagement with Society

Students should engage effectively as citizens of a multifaceted world informed by an understanding of historical and social determinants.

LEARNING OBJECTIVES

- Demonstrate the ability to engage effectively and thoughtfully with societies in which they live and work and with people of different cultures, backgrounds, and values.
- Demonstrate the ability to understand how history and current events inform efforts to make societies humane and just.

course requirements

- 12 credits of coursework, in FA3 and FA4 combined, with at least 3 credits in FA4
- For BA degree, 3 of the 12 credits must be 300-level or above

ePortfolio assessment

Not required unless applying research or independent study to FA4 credit requirement

FA5

Ethical Reflection

Students should be reflective, effective ethical agents.

LEARNING OBJECTIVES

- Demonstrate the ability to act with ethical agency in their personal and professional lives by exploring various perspectives along ethical, moral, and social dimensions and applying these considerations to their decision-making.
- Students will understand their obligations as engineers.

course requirements

- Course introducing the practice of ethical reflection

ePortfolio assessment

1 ethical reflection sample from engineering coursework, research, or independent study

FA6

Conceiving of & Realizing Projects

Students should be able to independently conceptualize and complete large-scale, consequential projects.

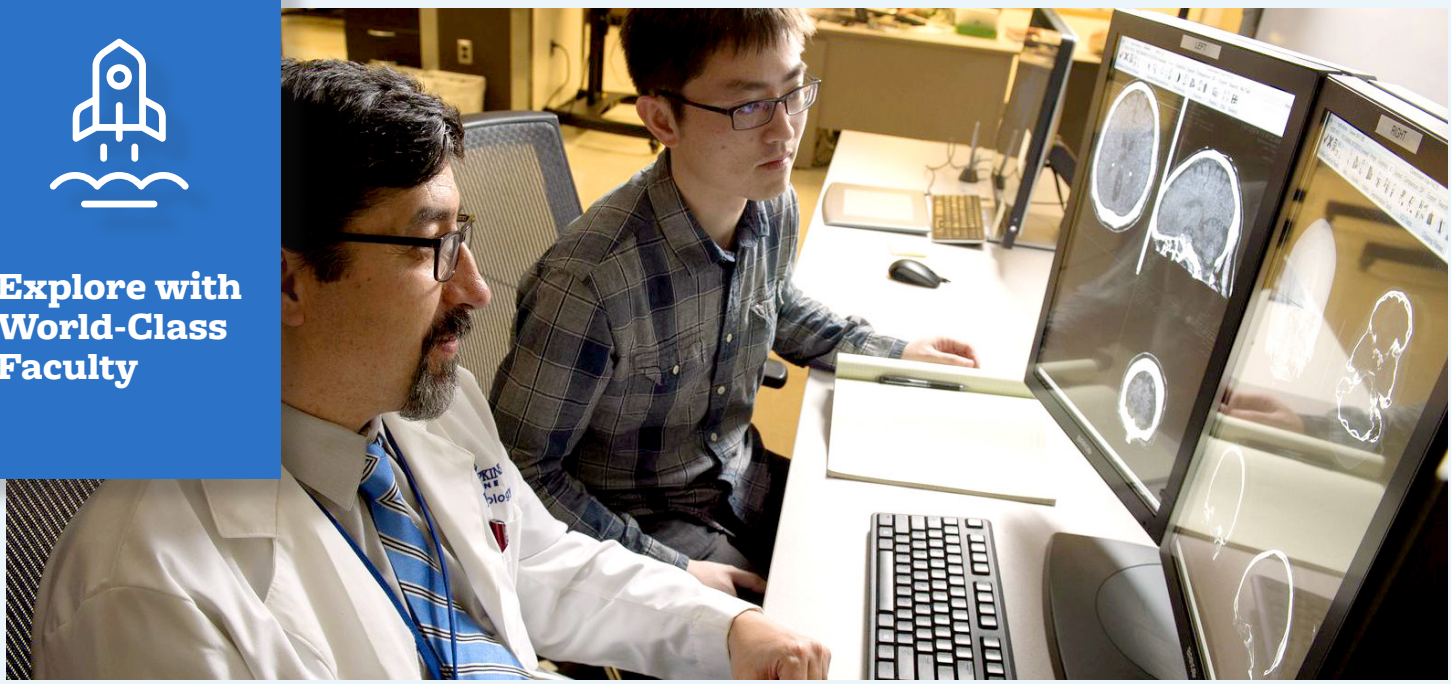
LEARNING OBJECTIVE

- Demonstrate the ability to conceptualize, develop, and deliver consequential projects with ambitious scope, individually or in collaborative teams

ePortfolio assessment

Two projects from coursework, research or independent study

Explore with World-Class Faculty



Customized Academic Learning: Our Signature Practice

Expand the bounds of knowledge at the first U.S. research university
Research has been the core of Hopkins' identity since its founding in 1876. Students are afforded opportunities for faculty mentored investigation. Such work frequently culminates in significant student contributions to their field.

Customized Academic Learning (CAL) is an umbrella term for informal learning opportunities that are mentored and assessed by university faculty. **CAL** includes research for credit, independent study projects, and for-credit internships. These may be undertaken individually or in groups.

CAL is ubiquitous in engineering at Hopkins, where upwards of 60% of students engage in research for credit during their time as an undergraduate. The quality and centrality of CAL distinguishes what it means to have graduated as a Hopkins Engineer. Unlike classroom learning and instructional laboratories, CAL leverages unique opportunities for academic engagement.

Hopkins Semesters: Mentored Immersive Experiences
Hopkins Semesters extend CAL to include immersive semester-long engagement, whether in creative activity, professional exploration, or research. A Hopkins Semester is an optional junior or senior year, semester-long, mentored experience that provides students the time for a focused, deep, and rigorous exploration of one complex subject or endeavor. These experiences are designed by the student with faculty guidance. They require ongoing academic engagement with Hopkins experts to support the achievement of the student's desired learning goals.

Design Your Life Project

Your ePortfolio, Your Learning Journey

Each Hopkins engineering undergraduate curates a digital collection of artifacts, created in a platform provided by the university, that characterizes their learning experiences. While written products are the dominant form of submission — essays, theses, research reports, etc. — students also share musical performances, video content, oral presentations, artwork, detailed plans and diagrams, or other evidence of their learning. There is an ever-expanding educational literature regarding the use of "folio thinking" to support student reflections and connections amongst coursework, extracurricular involvement, and work experiences.[4, 5] Hopkins engineering embraces the systematic documentation and reflection by students on their work as an educationally "high-impact practice."[6]

A student's ePortfolio serves three primary functions: to share and reflect upon a student's own growth and development under the guidance of a faculty mentor, to submit work as evidence of a student's attainment of proficiency in a foundational ability, and to showcase accomplishments for professional advancement. Students also incorporate work done outside the classroom into their ePortfolio.

[4] Cambridge, D., Cambridge, B. L., & Yancey, K. B. (Eds.). (2009). Electronic portfolios 2.0: Emergent research on implementation and impact. Stylus Publishing, LLC.
[5] Chen, H. L., Light, T. P., & Ittelson, J. C. (2011). Documenting learning with ePortfolios: A guide for college instructors. John Wiley & Sons.
[6] Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., & Chen, H. L. (2016). ePortfolios–The eleventh high impact practice. International Journal of ePortfolio, 6(2), 65–69.

The curation of a student's learning journey is instrumental for making purposeful decisions about academic and professional life. Apart from establishing a digital presence beyond social networks, the ePortfolio facilitates students' interactions with their mentors, advisors, coaches, and future employers by providing insight into each student's interests and their emerging life project. Discussions regarding the ePortfolio are instrumental in helping students consider their educational directions and weigh their choices for future endeavors.

Faculty deploy ePortfolios to afford students clear milestones regarding their academic development. ePortfolios are also used as a mechanism to ensure that student work done toward the attainment of their foundational abilities in writing, oral communication, ethical reflection, and conceiving and realizing projects is not a "one-and-done" affair, but instead engages iterative, longitudinal improvement by providing numerous opportunities for practice. Assessment serves as an invitation for students to aim higher on their next iteration.

Three Primary Benefits of ePortfolios

Coursework and Customized Academic Learning (CAL):

For use in a class, research project, or independent study to document the work product arising from academic engagement.

EXAMPLE: Descriptive text, graphs, images, video, and other evidence arising from a design, research or independent study project.

REVIEW: Formal by research or independent study supervisor or by a course teaching team. Assessment may serve to demonstrate proficiency in a Foundational Ability necessary for graduation or to demonstrate advanced achievement.

Mentoring and Advising:

For use by students to reflect on their learning journey at JHU.

EXAMPLE: Reflective writing making connections between the curricular and co-curricular endeavors students have undertaken. These serve as a window for faculty mentors, professional academic advisors, and others to engage students in formative conversations and to write meaningful letters of recommendation.

REVIEW: Only informal.

Employability and Professional Advancement:

For use to showcase accomplishments to others.

EXAMPLES: Highlights of design projects undertaken within courses, reflections on teamwork, leadership, volunteer activities, and/or co-curricular participation, presentations to external audiences, as part of business plan competitions, etc.

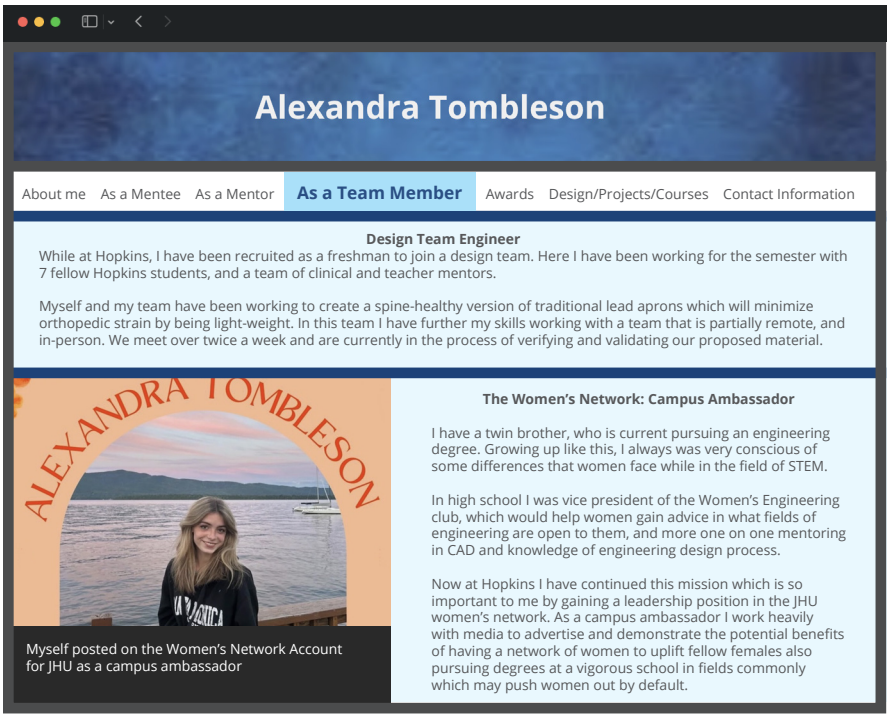
REVIEW: Primarily informal; possibly formal as part of a hiring or admissions decision.

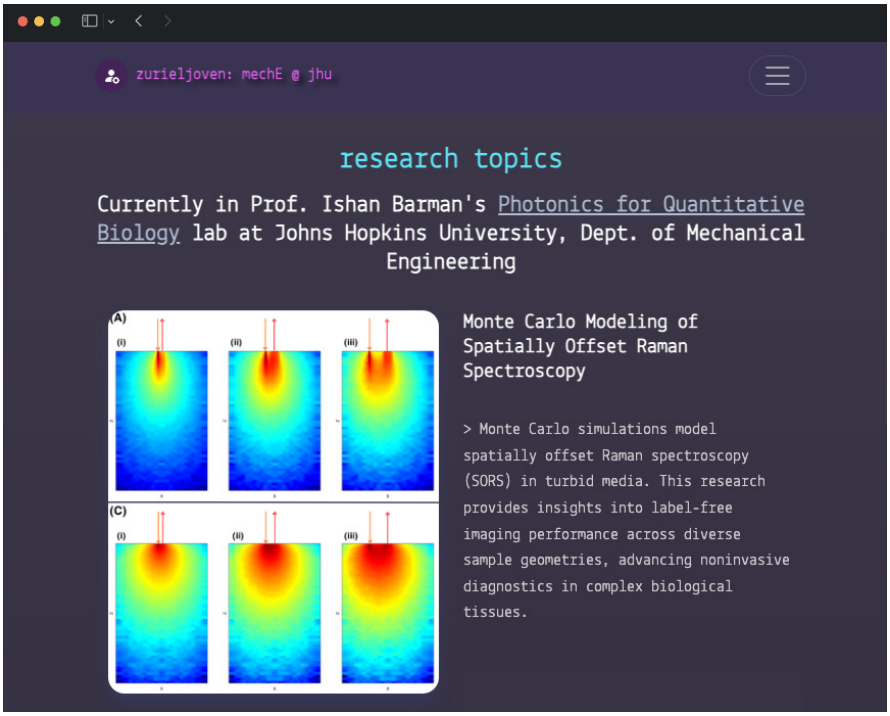
Reflecting on ePortfolios

“ — ”

I believe the best way to express who I have become as a student is to explain my relationship to my extracurriculars. Serving as a coach and a teaching assistant have given me a sense of fulfillment and enabled me to use my experiences to help my community.

ALEXANDRA TOMBLESON
“About Me” project in support of first-year mentoring and advising





“ — ”

I felt it was important to share my work beyond just publishing journal papers. Maintaining a portfolio is a strong way of defining one’s self-image, an important aspect for both sharing your efforts and introducing yourself to others.

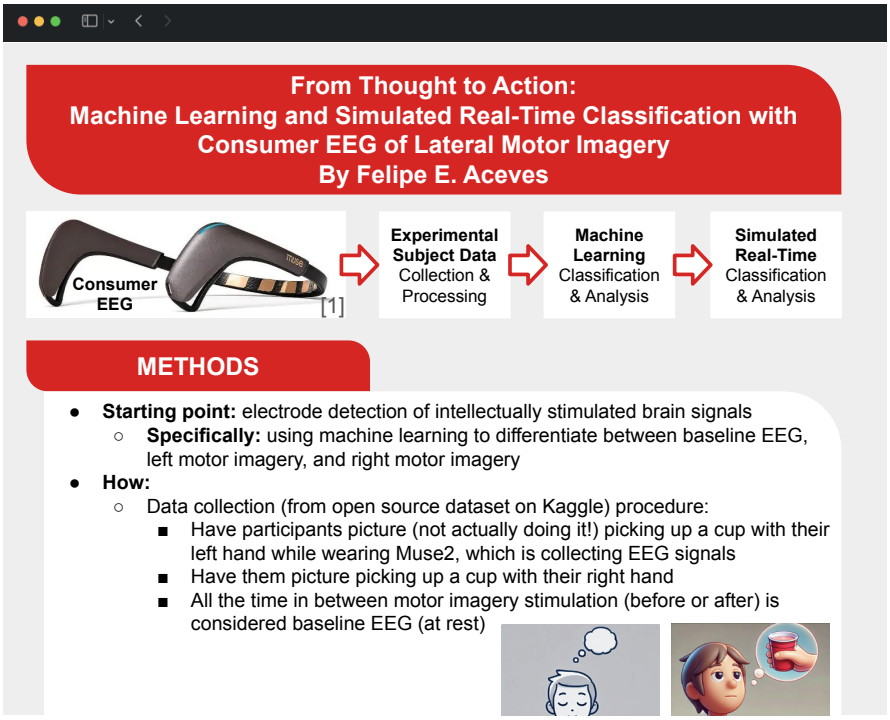
ZURIEL JOVEN
ePortfolio documenting research in biophotonics for disease detection and monitoring

Reflecting on ePortfolios

“ — ”

I chose to display different projects I worked on (research, design, leadership, and service oriented) as well as things I learned and accomplishments. It was meaningful to share with mentors because it helped some write recommendations and just overall learn more about me as a holistic person, as I had a hobby section.

ANGELA SADLOWSKI
ePortfolio developed as part of successful Yale medical school application



“ — ”

Turning a question into intriguing, sharable results with support from collaborators and instructors was meaningful to me because it captured the excitement of scientific inquiry—asking questions, thinking big, tackling challenges, and growing through discovery.

FELIPE ACEVES
ePortfolio submitted as part of a final project in a biomedical data science course

"We do not learn from experience... we learn from reflecting on experience."

JOHN DEWEY, 1933
Dewey received his PhD from Johns Hopkins University in 1884

Reflection as the Key to Lifelong Learning

Engineering education requires learning by doing, but the "aha!" moments that propel students to deep insights happen in moments when students reflect on the challenges they encounter. Many components of the Hopkins undergraduate engineering experience have been designed to instill a practice of reflection to deepen learning, enhance critical thinking, promote self-assessment, and build the skills required for inquiry.

"The real value in failure is what you learn from it... You learn in the moments when a device is not behaving the way you think it should... It took a while for me to get to the point where I would find those moments to be interesting instead of frustrating. This removed the fear of failure from my work... It was one mistake after another that led us to the invention of the electret microphone at Bell Labs in the early 1960s."

JAMES WEST, 2015

Reflection from an interview with Jim Duffy in the HUB Gazette. West is a JHU electrical and computer engineering professor. The electret microphone remains the dominant technology to this day.

Join a Caring Intellectual Community

Welcome to the Flock

In engineering at Hopkins, academic advising and mentorship are built on relationships—faculty mentors, professional advisors, and life design educators work in concert to support students' journeys. Departments collaborate with the Office of Engineering Advising to ensure students have access to the right resources at the right time. Through this network, students are not only guided but empowered to guide one another—to study together, challenge each other, and become each other's strongest support system.

Each fall, a new group of students arrives ready to embark on an academic journey defined by innovation, collaboration, and boundless possibility. From the very first day, they join a thriving flock—faculty, staff, mentors, and peers—who will support and challenge one another to soar higher. Here, no one flies alone.

This is a place where ideas take flight, friendships form, and a shared pursuit of excellence shapes the future. **Welcome to the flock.**

YOUR FACULTY MENTOR: A GUIDE FOR THE JOURNEY

Every student is paired with a faculty mentor—an experienced guide who fosters a collaborative learning relationship and serves as a role model. This mentorship begins with a "startup mentor" who helps lay a strong foundation, often continuing throughout the undergraduate experience. As students advance and refine their academic paths, their faculty mentor aligns with their primary major, ensuring specialized guidance.

Mentorship is not a singular relationship—it is a network. Students are encouraged to collect mentors along the way, seeking different perspectives for different goals. Every mentor undergoes training to refine their approach, ensuring that students receive thoughtful, informed guidance. Additionally, students are trained on how to engage meaningfully in the mentoring relationship. First-year students are required to meet with their mentors twice per semester, while sophomores, juniors, and seniors are required to meet at least once per semester.

Faculty Mentors help students:

- Navigate the culture and expectations of the Whiting School of Engineering.
- Engage deeply in their field, understanding the 'how' and 'why' of engineering.
- Develop the habits of professional and academic success.
- Make informed decisions about courses, research opportunities, and career trajectories.

YOUR PROFESSIONAL ACADEMIC ADVISOR: A STEADY COMPANION FROM START TO FINISH

Professional academic advisors provide essential, consistent guidance throughout the undergraduate experience. From the moment students arrive to the day they graduate, these advisors ensure smooth navigation through policies, degree requirements, and academic milestones. The professional academic advisors who work closely with first-generation and limited-income (FLI) students are also success coaches, providing additional guidance and advocacy.

Students are required to meet with their professional academic advisor/advisor coaches at least once per semester to ensure they are making progress and receiving the necessary support. Advisors are more than navigators; they are steadfast supporters, helping students balance ambition with well-being, structure with exploration, and challenge with opportunity.

Professional Academic Advisors and Academic Advising Success Coaches:

- Offer clarity on university and school policies, ensuring students stay on track.
- Assist with registration, course selection, and degree planning.
- Connect students to academic resources and well-being support.
- Oversee external course review processes, ensuring seamless integration of transfer credit

YOUR LIFE DESIGN EDUCATOR: SHAPING YOUR FUTURE THROUGH CURIOSITY AND COMMUNITY

Designing a meaningful future happens through curiosity, community, and courageous experimentation. Life Design Educators (LDEs) guide students through this ongoing process, helping them connect the dots between their interests, values, identities, and academic experiences.

At the heart of life design is experience and connection—and alumni, staff, and faculty mentors play a central role. From city-based treks and Explore Tours to the credit-bearing Life Design Summer Experience Practicum, every applied life design experience is intentionally infused with opportunities for students to build meaningful relationships with alumni and industry partners. These connections help students see the range of possibilities available to them and provide critical insight, mentorship, and inspiration.

Life Design Educators help students:

- Reflect on their experiences and imagine possible academic, professional, and personal paths.
- Practice telling their stories through resumes, personal statements, ePortfolios, and interviews.
- Explore real-world opportunities like internships, research, and community engagement.
- Navigate uncertainty with confidence, creativity, and a sense of agency.

ENGINEERING BEYOND THE CLASSROOM

At Hopkins, engineering student engagement goes far beyond the classroom—it is where innovation meets community. Our students bring knowledge to life through research, design teams, and vibrant student organizations that tackle real-world challenges and build lasting connections.

Whether designing off-road vehicles with Blue Jay Racing or launching rockets with the AstroJays or the Hopkins Student Wind Energy Team, students collaborate across majors and class years, gaining early exposure to the skills, teamwork, and leadership that shape future engineers. These experiences provide early exposure to hands-on technical skills, collaboration, and leadership—tools essential for success in both academia and industry.

But engagement is not just about preparing for the future—it's also about community and connection. Each year, the Society of Women Engineers hosts Tower of Power, an exciting engineering challenge for local middle school students, sparking curiosity and inspiring the next generation of problem-solvers. Other groups tutor elementary and high school students, offering mentorship and academic support that can ignite a lifelong passion for STEM.

From co-curricular clubs to professional societies, WSE students find spaces to explore interests, celebrate their identities, and grow as both engineers and people. Student groups are a launchpad for developing leadership, making friends, and simply having fun doing something you love with people who inspire you.

WSE Faculty and Department Staff who contributed to the development of these recommendations

APPLIED MATH AND STATISTICS
Nicholas Charon
Donniel Fishkind ‡§
Sergey Kushnarev
Daniel Robinson •

BIOMEDICAL ENGINEERING
Jordan Green
Eileen Haase ‡
Elisabeth Logsdon ‡
Feilim Mac Gabhann *
Constanza Miranda
Sridevi Sarma •
Winston Timp §

CIVIL AND SYSTEMS ENGINEERING
Thomas Gernay
Rachel Sangree *†‡

CHEMICAL AND BIOMOLECULAR ENGINEERING
Lise Dahuron ‡§
Jeffrey Gray §
Yannis Kevrekedis †
Konstantinos Konstantopoulous
Lilian Josephson ‡
Sakul Ratanalert

CENTER FOR LEADERSHIP EDUCATION
Nusaybah Abu-Mulaweh
Larry Aronhime
Jenna Frye
Trevor Mackesey *†
Alissa Burkholder Murphy
Julie Reiser ‡
Andy Ross
Mia Russell
Pamela Sheff •
Bill Smedick §

COMPUTER SCIENCE
Laura Graham •
Ben Langmead
Ali Madooei
Sara More
Joanne Selinski †‡

ELECTRICAL AND COMPUTER ENGINEERING
Lucas Buccafusca
Mounya Elhilali †
Pablo Iglesias •
Pedro Irazoqui
Susanna Thon §‡

ENVIRONMENTAL HEALTH AND ENGINEERING
Ciaran Harman †
Hari Rajaram *‡

MATERIALS SCIENCE AND ENGINEERING
Michael Falk §•
Patricia McGuiggan †
Orla Wilson *§‡

MECHANICAL ENGINEERING
Noah Cowan †
Ishan Barman
Steven Marra *‡

UNDERGRADUATE ACADEMIC AFFAIRS
Constanza Miranda §
Linda Moulton §
Denise Shipley §
Janet Weise §
Kimberley Bassett Zing §

* WSE Blueprint Committee Chair
† WSE Faculty Senator
‡ Director of Undergraduate Studies
• CUE2 Commission Member
§ Excellence in Academic Advising Committee Member