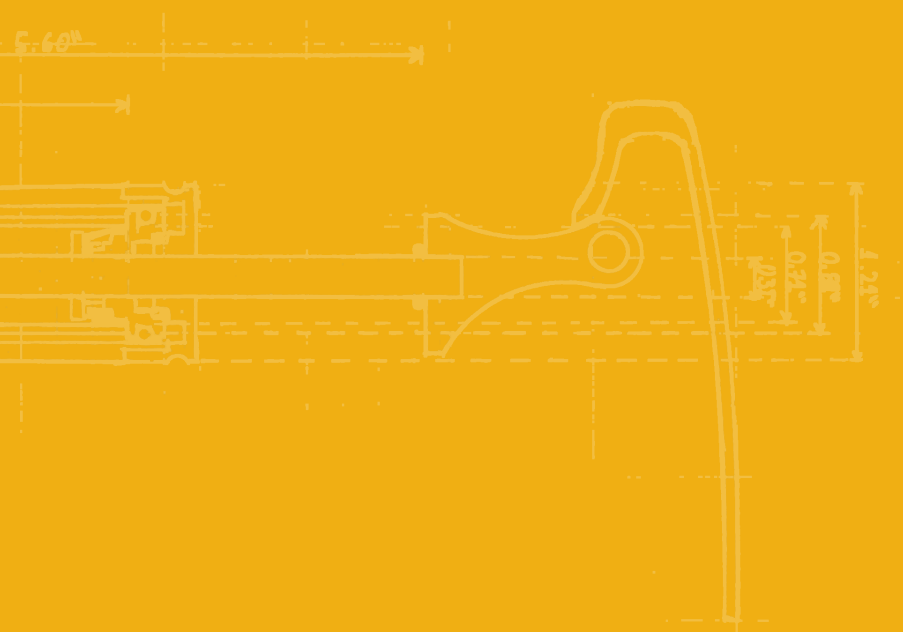
high school engineering

ENGINEER YOUR WORLD

THE UNIVERSITY OF TEXAS AT AUSTIN

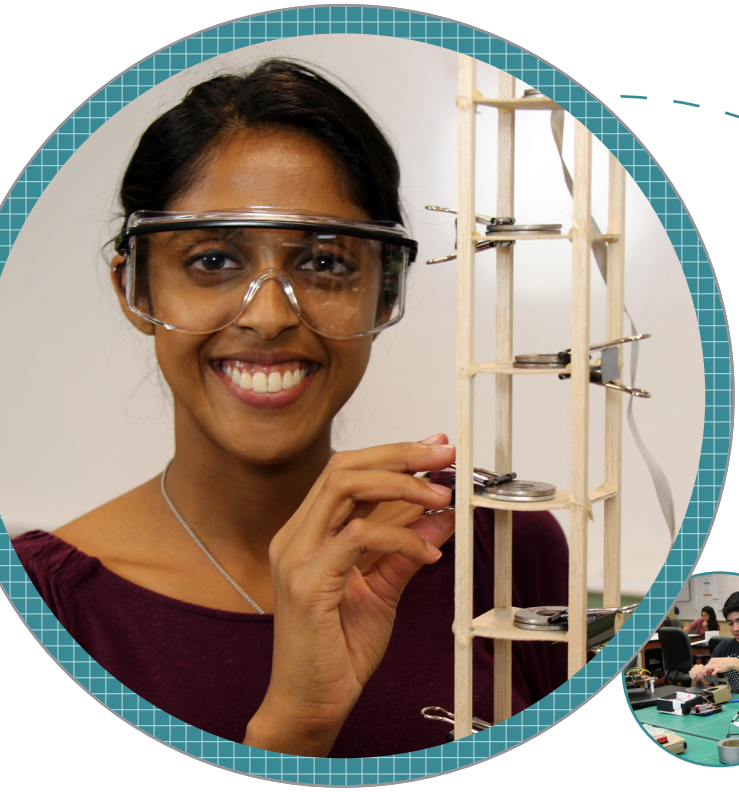
engineeryourworld.org

inspiring tomorrow's problem solvers



The University of Texas at Austin

Cockrell School of Engineering



THE FUTURE OF ENGINEERING EDUCATION

In 2008, the National Science Foundation awarded The University of Texas at Austin $12.5 million to develop innovative solutions for high school engineering education. The cornerstone of this work has been the creation of an exemplary engineering curriculum and teacher support program, *Engineer Your World*.

Designed by faculty in the university's Cockrell School of Engineering and College of Education — both top-10 programs — and in collaboration with NASA engineers and secondary education specialists, *Engineer Your World* is transforming how the discipline is introduced and taught in high schools across the United States.

As a top-ranked center of engineering education and research and a globally recognized leader in innovation, the Cockrell School is committed to expanding access to high-quality engineering education for all students. We hope you will join us as we continue to redefine the future of engineering education.

Sharon L. Wood
Dean, Cockrell School of Engineering

ENGINEERING EDUCATION FOR THE 21ST CENTURY

Engineer Your World fills a national need for a high-quality, low-cost, design-based engineering program that can be implemented in virtually any high school.

DESIGNED BY EXPERTS

Our curriculum design team includes experts from many fields. University engineering faculty incorporate rigorous and authentic engineering practices. Learning scientists align the curriculum with research on how people learn. Engineers from industry make real-world connections. Secondary teachers maintain a focus on what is achievable in the classroom.

ADAPTABLE FOR ANY SCHOOL

Our courses are designed with versatility in mind. Some schools offer *EYW I: Engineering Design & Analysis* as a standalone elective while others integrate one or both *EYW* courses into an existing STEM or engineering pathway. With courses aligned to multiple sets of state and national standards, we can help you meet your school's goals for student engagement and learning.

ENGAGING AND EMPOWERING ALL STUDENTS

Our courses offer valuable learning opportunities for all students, regardless of their future career plans. While most students leave our program with an interest in pursuing an engineering degree or career, all students benefit from learning to think critically and solve complex problems.

BUILDING TEACHER CAPACITY

We work with teachers from all backgrounds. Our exceptional teacher professional development and ongoing support programs are based on the nationally recognized UTeach teacher preparation model and aligned with published national standards of excellence.

EXPANDING STUDENT OPPORTUNITIES

We are committed to meeting students' changing needs and expectations. From developing dual-enrollment options that let students earn college credit to hosting events that take design from the classroom to the community, we never stop looking for new ways to engage students and promote achievement.

COMMITTED TO AFFORDABILITY

Our charge from the National Science Foundation was to create a high-quality, low-cost program that schools can sustain over time. We remain dedicated to making engineering affordable and accessible for all schools and students.

"Adopting the Engineer Your World *program has been a game changer for our campus. It gives students a skillset that they cannot get in any other course. If I could demand it, I would put every student in the program."*

– Rosemary Kelly
Principal
Legacy Early College High School
Taylor, TX

COURSES DESIGNED BY EXPERTS

Engineer Your World courses are designed by University of Texas engineering and education faculty, industry and NASA engineers, and experienced secondary educators. Our work is guided by six principles based in learning sciences research.

Student Learning is Tightly Scaffolded

The engineering learning objectives of each unit are specific and are useful to students in subsequent units.

The Engineering Design Process is Central

The curriculum employs a standardized engineering design process as an instructional framework.

Students Experience Authentic Engineering Practices

Students are engaged in meaningful, if simplified, versions of engineering practices.

Math and Science Are the Tools of Engineering Design

Design challenges require the purposeful application of STEM concepts that are clearly necessary for the successful completion of the projects.

The Message Matters

The STEM design challenges illustrate engineering's potential to impact human health and the environment in a positive manner.

There is No "Right Answer"

All STEM design challenges have multiple successful solutions.

Engineer Your World courses engage students in authentic engineering design and computing practices in a problem-solving, inquiry-focused, project-based environment.

EYW I: Engineering Design and Analysis

Students discover the engineering design process, make data-driven decisions, and work in multi-level teams to solve complex challenges. Students explore mechanical, chemical, civil, electrical, and aerospace engineering through design challenges including:

- Making portable pinhole cameras for artists with disabilities
- Designing earthquake-resistant buildings
- Creating automated aerial imaging systems for targeted disaster relief efforts

EYW II: Engineering Applications of Computer Science

Students develop the computational thinking skills required in modern engineering. Algorithmic thinking, data representation, programming, and modeling enable teams to solve hands-on design challenges including:

- Optimizing mechatronic assistive devices (such as automated turntables and smart lighting systems)
- Developing a customizable image filter for creative professionals
- Creating a graphical user interface to guide physical therapy patients through rehabilitation exercises

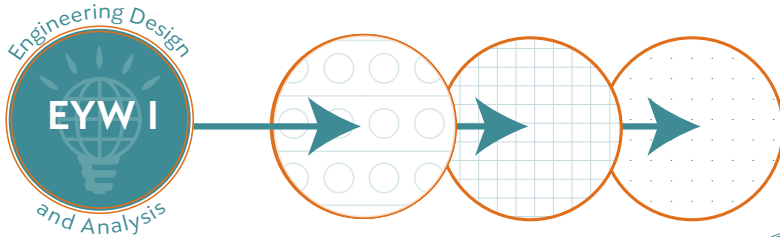
View course descriptions and sample lessons at:
engineeryourworld.org

ADAPTABLE FOR ANY SCHOOL

Flexible course design creates meaningful learning experiences for students at every grade level. Here are some ways that our partner schools have used our courses to start, expand, or improve their STEM pathways.

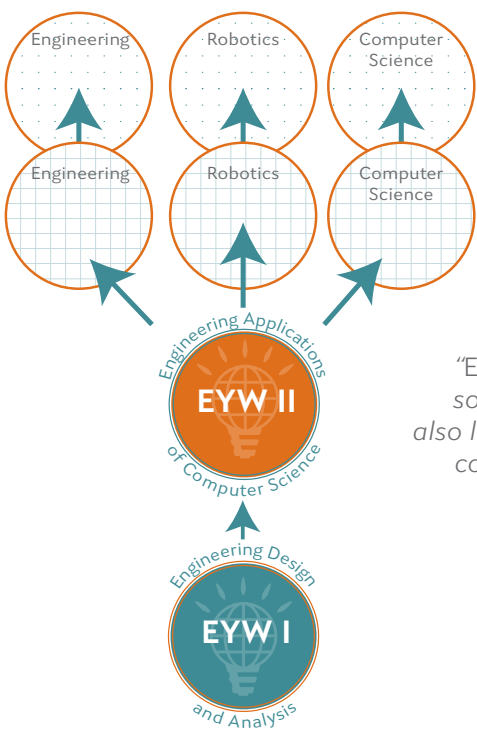
EYW I and *EYW II* as foundational courses

Many schools use *EYW I* as a foundational course. This gives students a strong foundation in engineering design and motivates future math and science learning.



"It's amazing to see how students apply the skills learned in EYW I, *both in the Engineering pathway and in their non-Engineering classes because these design practices become so natural to them. I believe* EYW I *should be required for all students interested in our STEM pathways so we have a common language for design thinking across our school."*

– Melanie Kong
Tesla STEM High School, Redmond, WA



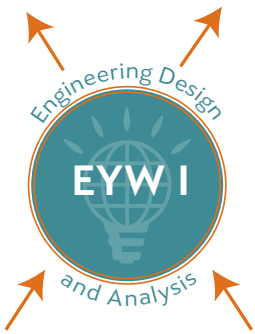
Other schools use *EYW I* and *II* as a foundational sequence. Students who complete these two courses are prepared to succeed in pathways ranging from design to robotics and computer science.

*"*EYW *gives all of our engineering students a solid foundation in engineering design while also letting students explore engineering before committing to a multi-year course of study."*

- Jad Jadeja
Dripping Springs High School,
Dripping Springs, TX

EYW I as a stand-alone elective

Schools that offer *EYW I* as a stand-alone elective can place the course anywhere in their curriculum. This offers a unique opportunity to engage students from one or multiple grade levels in collaborative problem solving.

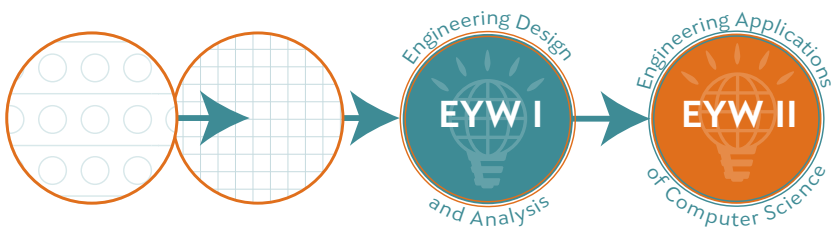


*"*EYW I *is attractive to students who are hungry for new ways to explore, team, and tinker. We love the course because it reinforces crisp and clear scientific writing, pushes kids to apply experimental design and to collect and analyze data, and explores a variety of engineering fields through direct experimentation and research."*

– Ellen Browne
and Don Gibbs
Pomfret School,
Pomfret, CT

EYW I and *EYW II* as a capstone sequence

Some schools offer *EYW I* (or *EYW I* and *II*) as a capstone experience. Students synthesize prior learning in mathematics, science, and engineering to solve the challenges in more sophisticated ways.



*"*EYW *allows students to apply and synthesize content they have learned in math and science courses to solve real-world problems. It naturally prepares students for more advanced studies and serves as a bridge between high school and college coursework."*

– Elyse Zimmer
KIPP, Houston, TX

ENGINEER YOUR WORLD IS STANDARDS-BASED

- Next Generation Science Standards for Engineering
- Common Career Technical Core and Common Core Standards for ELA (Writing, Science & Technical Subjects)
- Framework for 21st Century Learning
- State standards in Texas, New York, California (A-G approved under both D and G), and many other states

ENGAGING AND EMPOWERING

Engineer Your World believes in inclusivity in engineering education. Our courses help ALL students see themselves as creative problem solvers.

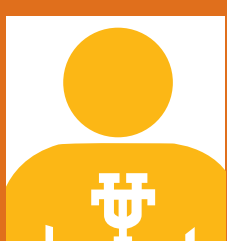
> *"I have a variety of students, from high-achieving, AP-type students to those who struggle a bit in traditional science courses. What I love is that they work together to solve problems that maybe neither can solve individually."*
>
> – Amy Morriss
> Teacher at Academy of Our Lady, Marrero, LA

Our students develop engineering habits of mind and 21st century skills. For some, the technical skills they build will serve as a solid foundation for future engineering coursework. For others, the greatest benefit is in learning to solve problems methodically and collaboratively, a necessity for the modern workplace.

21st Century Skills

- Creativity
- Critical thinking
- Problem solving
- Communication
- Collaboration

STUDENTS CAN EARN COLLEGE CREDIT



Students who want to earn three hours of college credit can build on their work in the *EYW I* high school course to pursue optional **dual-enrollment** credit. These students complete additional online assignments to demonstrate a deeper understanding of course concepts.

Learn more about dual enrollment at
engineeryourworld.org

23,000

students served in the first seven years

Diverse Student Populations

42%
Hispanic

10%
Black

32%
Women

Inspiring Future Engineers

45%
of students completing *Engineer Your World* plan to major in engineering in college.

60%
of students completing *Engineer Your World* express interest in an engineering career.

BUILDING TEACHER CAPACITY

Our exceptional teacher programs are based on the nationally recognized UTeach teacher development model and aligned with published standards of excellence for K-12 engineering professional development. Our two-pronged approach:

Starts with a transformative professional development institute. This two-week experience:

- Engages teachers in authentic engineering practices
- Builds pedagogical content knowledge for project-based instruction
- Facilitates collaborative strategic planning
- Establishes communities of practice to support successful implementation

Continues with comprehensive ongoing support. Our researched-based methods include:

- Outreach from staff engineers and instructional support specialists
- Membership in virtual and real-life communities of practice
- Access to online platforms that support peer-to-peer sharing of best practices

"I wish every professional development program would take some notes from Engineer Your World. *Every single thing was relevant. This is one of the best professional developments that I have ever been to."*

- Marissa Logrono
Engineer Your World teacher
Langham Creek High School
Houston, Texas

WHY *ENGINEER YOUR WORLD*?

Hundreds of schools across the nation - and beyond - choose *Engineer Your World* because:

WE ENGAGE STUDENTS

EYW students:

- Develop creative problem-solving and engineering design skills
- Experience the power of collaborating to solve complex, modern problems
- Pursue optional college credit from a top-ranked engineering program

WE EMPOWER EDUCATORS

EYW teachers:

- Experience a transformative professional development program
- Engage in virtual and real-life communities of practice within a vibrant peer network
- Benefit from ongoing support by instructional coaches and staff engineers

WE'RE MOVING FORWARD

EYW is committed to:

- Expanding course offerings for middle and high school
- Growing our network of university partnerships
- Collaborating to expand student opportunities, from Design-A-Thons to dual-enrollment courses

"We created Engineer Your World *to attract a new generation of engineers to help us solve the world's most pressing problems.*

We envisioned a program that would inspire young people to experience the creative side of engineering and its potential to shape our world. At the same time, we refused to sacrifice the rigor that would prepare young people for success in future STEM studies and careers. After years of collaborative course development and classroom testing, Engineer Your World *has fulfilled this vision.*

As the dual-enrollment instructor for students seeking university credit for Engineer Your World, *I see first-hand the quality of work that our students produce and how they grow over the year. Students who succeed in this class build a solid foundation for college engineering coursework.*

As an engineer and an engineering educator, I can think of nothing more important than inspiring and preparing the next generation of problem-solvers. It is my goal that someday every student will have the opportunity to take an Engineer Your World *course."*

- Professor David T. Allen
Gertz Regents Chair in Chemical Engineering
The University of Texas at Austin
Member, National Academy of Engineering

Learn more, start planning,
or enroll your campus today:

engineeryourworld.org

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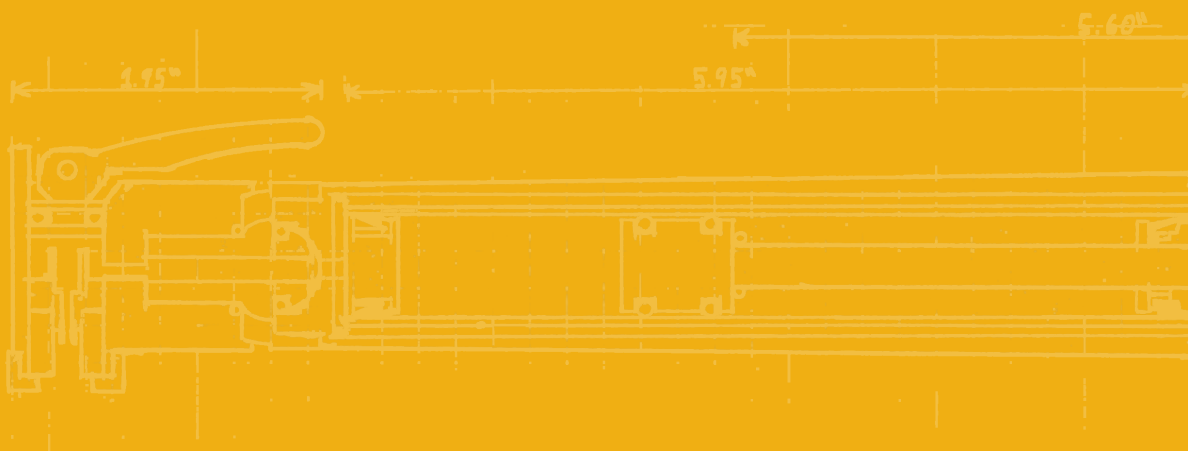

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WHERE DISCOVERIES BEGIN