The Science and Ethics of Synthetic Biology - Buzz Course

SynthEthics

Course Overview

For the first time in history, mankind can alter the blueprint of life. However, with such great power comes great responsibilities and a need for thorough ethical considerations before acting. This course will teach you about synthetic biology, a growing subfield of biotechnology which brings together the tools of genetic manipulation with engineering principles, as well as the ethical implications progress in the field entails.

During the weeks, accomplished global youth leaders and young researchers representing the international initiative, SynthEthics (www.synthethics-bio.com) will come along and guide the participants in the maze of new-era biotechnology. Synthetic biology is one of those fields where it is best to get things right the first time because it might be the only chance we get.

Course Goals

This course will not only provide the possibility to become well-versed in one of the most promising and relevant fields of science but regardless of prior interest, equip students with the essential skills of rational analysis, ethical evaluation, informational literacy and flexible awareness.

Students by the end of the six weeks will look at present issues through a more clear and ethically just lens, gaining the ability to form and voice reliable assessments on any topic, while promoting composed communication and productive collaboration.

Student Project

Group project (2 members): creating a case-study on a specific significant scientific invention (primarily chosen from the course's three major topics discussed on Week 2-4), highlighting its possible ethical implications and forming a risk-assessment model. Each group will present their project at the end of the course.

The best two group projects will have the opportunity to be featured in a special episode, a discussion night on the Drop the STEM podcast (www.dropthestem.com).

Acquired Skills

- Soft skills: critical thinking, problem-framing and solving, analytical reasoning, adaptable intelligence, effective communication, collaboration
- Hard skills: research process, ethical decision-making, information literacy, organisation of arguments

- Recommended age limit: 13 years and up

Syllabus

Each Zoom lecture is held for approximately 60 mins, starting with 40 mins of material presented by the instructors (slides). We lay great importance on providing students with the scientific knowledge of today's cutting-edge technologies and innovations while highlighting the ethical, philosophical and legal challenges they present to our society.

The lecture is followed by 20 mins of shared discussion session with the students, reflecting on the previously displayed knowledge. It is based on an ethical questionnaire outline, that serves as a basis for managing communication while remaining eager and open to discuss any new takes that might emerge (Q and A-style).

After the guided ethical evaluation and brain-storming, at the end of each lecture, we recommend additional reliable resources for further investigation that will help the students prepare for the final virtual group project presentation. Students will submit their homework, watching an assigned video / reading an article , two days before the upcoming lecture.

A written summary of each class will be available, but the availability of materials depends on the instructors' preference and privacy copyrights.

- Week 1: Introduction to Synthetic Biology

Central Topics
- Week 2: Medicine and Gene-editing Technologies
- Week 3: Agricultural Biotechnology and Ecology

- Week 4: Artificial Intelligence and Neuroscience

- Week 5: Q and A session with iGEM Team representatives

Explore more about how the mission of SynthEthics is closely tied with the International Genetically Engineered Machine Foundation and Competition in the attached brochure.

- Week 6: Presentation of Group Projects, End of Course

Teaching Method

Our teaching method follows a high-tech, student-centered approach, facilitating cooperative learning. Most importantly the lectures are:

Informative: we seek to bring information outside of the contents of the general textbook, presenting up-to-date research rather than general easily accessible information.

Intersectional: When tapping into a particular scientific issue, we infuse the ethical aspects, both beneficial and disadvantageous sides with the given topic.

Interactive: Instead of one-way presentations, we facilitate self-actualisation and critical thinking skills while exploring the given material. Dialogue beats monologue and leads to better results.

After the intro class that serves as a foundation for the next three major topics of Week 2-4, students will explore in detail the most prominent subfields where synthetic biology is applied.

Date and Place

Lectures are hosted on Zoom, starting from August 29th, in a weekly manner: every Saturday from 10 AM Eastern Time Zone (the course accepts students worldwide).

Guidelines

These guidelines serve to ensure the most rewarding educational experience:

- Active Involvement and Open-mindedness: we believe every student has an interesting angle to present, so be ready to share your ideas and participate in the discussions. We

seek to foster an environment of open-minded conversations and would like to see you become an engaged member of it.

- Respect for Instructors and Peers: settle any differences and engage in discussing opposing point of views peacefully, following communicational etiquette and netiquette.

- Willingness to Engage in Teamwork: exchange ideas, make decisions together, show initiative and keep working to accomplish your goals.

- Come Prepared to Classes: complete your assignments: being prepared is half victory, and we want you to win!

Instructors

Erik Hartman: Biomedical Engineering and Biomedicine, Founder - Sweden

Erik is one of the founders of SynthEthics, student of biomedicine and biomedical engineering at Lunds University, Sweden, who has been doing projects in translational medicine, synthetic biology, bioinformatics and most recently ethics. He was awarded the most prestigious award at the Sweden National Science Competition for Youth, 3rd award at Intel ISEF in 2018 and a gold medal at iGEM 2019. His most recent adventure is into the world of bioethics and genetic engineering. He's hopeful, although worried, about what the future may bring.

Blanka Novák: Microbiology, Pharmacology and Analytical Chemistry, Founder - Hungary

Blanka is one of the founders, organiser of the Global Ambassadors group via STEMPOOL at SynthEthics and host of the Drop the STEM podcast. Her passions encapsulate public outreach, foreign languages, visual and scientific communication. She is a university student and researcher in Microbiology. Her project was awarded First Prize at the Hungarian Innovation Youth Talent Contest, Bioeconomy Prize at EUCYS, 4th place at Intel ISEF 2019 and represented Hungary at SIYSS, attending the Nobel festivities. She believes that a lot of times, inactivity is not due to a lack of interest but information. Therefore, to her making the advancements of the STEM fields, the possibilities of synthetic biology known and understandable to others is paramount: turning walls into doors.

Shaira Gozun: Life Sciences, Materials Science, Ambassador - Philippines

As a student innovator, Shaira has worked on team projects involving Acoustics and Bioluminescence. These projects led her to to be a part of the Philippines team in international research competitions and meetings such as ISEF 2019, HKSSPC 2018, and ASA 178th meeting. Since 2017, she has been sharing her research knowledge and experience through talks, seminars, and student mentorships. Her current co-researchers are Neil David Cayanan and E'van Relle Tongol. She hopes that the awareness and involvement of the public in synthetic biology and ethics will lead to future applications and policies.

Lester Sabadao: Agricultural Sciences, Microbiology, Biotechnology, Ambassador - Philippines

Lester is a university student in Agricultural Biotechnology at The University of The Philippines - Los Baños. He and his co-researchers, Lia Tan and Alpha Acain, became finalists in the plant science category at Intel ISEF 2019, with their project that focused on agricultural and biosystems engineering. He also participates in organizations dwelling with population health like the Volunteer Youth Leaders for Health and has competed in parliamentary debate nationals and discussions in community policy making. Coming from a family of farmers, he draws most of his inspiration from their stories - making them a vital part of his researches. He has dedicated his life into ethical researches that bridge science to the people, for the people, and by the people.

Bea Suavengco: Microbiology, Plant Pathology and Biotechnology, Representative - Philippines

Bea is an Agriculture student in the University of the Philippines Los Banos who has been doing microbiology, plant pathology and biotechnology-related studies since 2016. She was a two-time gold medalist at the Kaohsiung International Invention and Design Expo in 2016 and 2017 and a finalist at Intel International Science and Engineering Fair 2019. She is an ambassador for Science and ultimately an ambassador of the Creator of Science. Bea is particularly passionate about reaching the next generation and promoting STEM in her community through talks, seminars and mentorships. For her, synthetic biology could offer powerful solutions to the world's most intractable problems but could also lead to detrimental outcomes in the wrong hands.

Jay Iyer: Microbiology, Chemical biology, Ambassador - Louisiana, US

Jay is a junior at Baton Rouge Magnet High School, in Baton Rouge, Louisiana. Jay is the founder and CEO of his non-profit organization, MIND Relief, where he provides support to caregivers and family members of those suffering from neurodegenerative diseases. He is also a two-time International Science and Engineering Fair (ISEF) finalist, two-time National Science Bowl finalist, and a one-time National Science Olympiad finalist. In addition, he is a student researcher at Louisiana State University, and has extensive research experience in neurobiology, chemical biology, and microbiology. Jay is also a Research Science Institute (RSI) Scholar, and a guitarist.

The number of instructors is subject to change.

Contact Information

Discord or Email: Student contact with teacher
Email: Communication with parents

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