

Course Schedule & our interview

Course Schedule

Week 1 - Engineering and Ethics

- How to understand engineering & ethics
- Clarify different ethical positions
- Main engineering ethical issues and principles

Week 2 - Risk, safety and responsibility

- Source of engineering risk and its prevention
- Ethical evaluation of engineering risk
- Ethical responsibility in engineering risk

Week 3 - Environmental ethics

- The establishment of environmental ethics
- The core issue of engineering environmental ethics
- Principles of environmental ethics in engineering practice
- The Relationship between engineering and environment

Week 4 – Bioethics

- The origin and development of bioethics
- Process that participants of practice bioethical decision-making should do
- Synthetic Biology Case Studies and Analysis

Our interview with Prof. Zhao

Q1: Why do we focus on ethical issue?

A1: Synthetic biology is a field with greater exposure to risks than other fields. Novel biological systems will be designed and then manufactured. In the short term, the technology could be used to make better drugs, agricultural products, or green fuels. But in the long run, due to various uncertainties of synthetic biology (e.g. the risk of gene pollution, or bio hazardous products), if there is no standardized protocols and supervised committees, they will be used improperly. It could bring great challenges to the management of environmental biosafety, or pose danger on biodiversity and environment. Remember, researches should be aimed at the good of people and society, so the application of scientific and technological achievements and scientific research actions need to be standardized. Especially during COVID-19 pandemic, ethics and biosafety play a more important role.

Q2: How can we deal with ethical issue?

A2: Ethics is the social norms of human behavior. There are some principles of dealing with

ethical issues: humanitarianism (the bottom line), social justice, and environment protection. Facing ethical problem, engineers should ensure human security and development first, following ethic rules which protect human interests and dignity. If science activity or application of new technology adds threat directly (bio weapons) or indirectly (contaminate the gene pool) to human society, we have to put human safety at priority. Moral constraint is the basis of further scientific development.

Q3: What is our responsibility in the project?

A3: First of all, it is necessary for every scientist to establish ethics awareness, and keep the “people-oriented” goal in mind when they design the projects. Then, they should ensure every research step should be implemented according to ethical principles, and rule out all hazardous consequences and possible risks. Then researchers should be trained on mastering technical skills, and learning guidelines and rules by heart. And when facing difficult problems later, consult to multiple opinions from various communities (like citizens, scientists, entrepreneurs, or governors), have more communication with the public to avoid any arbitrary decisions.

In your project, we suggest use organism with biosafety level (BSL) 1 or 2 and use protective equipment for the organism. During the whole engineering design circle, you should try your best to avoid releasing the organism or the genome outside the MFCs, though they always have some possibility to escape. For example, we typically use DNase or RNase, Kill switch, or add a semantic containment to genes, etc. in gene engineering, to limit the modified genome in the controlled areas. Exactly follow protocols in experiments and make operation rules to your final products to avoid any contamination. Also prepare some emergency measures for a possible leaking scenario.