

Biohack: Introduction to Synthetic Biology

Team Guanajuato in collaboration with Team Calgary, designed a small introductory course on the basics of biological engineering, consisting of 8 lectures and a Lab session through the course with duration of 2 months. These lectures were aimed at first semester Biotechnology students from the Monterrey Institute of Technology and Higher Education Campus Quéretaro. The course was given by Members of Team Calgary and Guanajuato_Mx

Objectives: To teach the fundamental principles that make the engineering of biology a powerful new tool for the creation of new synthetic biological systems.

Course Description: This class will introduce students to the (1) basics of Biology and Genetic Engineering, (2) the use of Design-Test- Build cycle, DNA synthesis, standards, and abstraction as tools for engineering biology, and (3) issues of human practices that include ethics and biological safety.

Duration: 8 weeks (Wednesdays 2:30 p.m- 4p.m)

Language: English/Spanish

Instructors: Uriel Eleazar Barboza Pérez iGEM Guanajuato_Mx
Tiffany Dang (iGEM Calgary),
Aidee Rodriguez (iGEM Guanajuato_MX)
Shalpinder Dhothar (iGEM Calgary)
Ryan Richardson (Harvard Medical School- Silver Lab) *¹

Syllabus:

Week 0: Guest VideoConference: Art, Design and Synthetic Biology. Christina Agapakis-Ginkgo Bioworks

Week 1: *Introduction to Biology*

- Information Storage in Biology
- Information Flow in Biology

Week 2: *Basic Tools of Genetic Engineering*

- Cloning (DNA Isolation and purification, Restriction enzymes and ligation)
- PCR & Electrophoresis
- Transformation (Heat Shock & Electroporation)

¹ The name Biohack Introduction to synthetic biology was a course originally designed by Ryan Richardson for a Science workshop in Guanajuato, Mexico. This new course was designed with Ryan's Feedback.

Week 3: *Basic Concepts in Engineering Biology & History of Synthetic biology Part 1*

- Engineering Tools used in Synthetic biology (Abstraction, Standardization, Orthogonality, Modularization, Modelling)
- Engineering Cycle (Design, Built, Test)
- Parts, Devices, Systems
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Week 4: *Basic Concepts in Engineering Biology & History of Synthetic biology Part 2*

- Engineering Tools used Biology (Abstraction, Standardization, Orthogonality, Modularization, Modelling)
- Engineering Cycle (Design, Built, Test)
- Parts, Devices, Systems
- Synbio Milestones (Synthetic Toggle Switch , Repressilator , Artemisin , Bacterial cell with Synthetic Genome

Week 5: *Ethics on Synthetic Biology*

- What is synthetic biology
- Applications
- Advantages of using Synbio
- Disadvantages (Drawbacks of this technology)
- Student Activity (Debate)

Week 6: *iGEM Projects Examples (Biobuilder)*

- Eu that Smell
- Itunes device
- Picture This
- What a colorful World
- iGEM Based project : What a colorful World (RFP, GFP, Amyl Cp)

Week 7: Lab Session

Week 8: *Synthetic biology Future Perspectives and Conclusions*

- Team Presentations (Project Results)