Bioengineering Curriculum Map

TOPIC	Duration
Unit 1 – Build a 3D printed prosthetic hand. Topic: The use of 3D printing for design of prosthetics. Project: Build a prosthetic hand chosen from seven available designs: Raptor Reloaded, Phoenix Hand, Cyborg Beast, Osprey Hand, Talon Hand, Odysseus Hand or Flexy Hand. Source: enablingthefuture.org, a global network of volunteers that makes upper limb prosthetics available as free open source 3D printable devices.	4 wks
Unit 2 – Redesign of a prosthetic hand. Topic: The engineering cycle. Group project: Optimize and redesign a prosthetic hand that operates with less force to overcome one of the major drawbacks of the prosthetic hands from unit 1.	2 wks
Unit 3 – Modeling of a viral epidemic and vaccines Topic: Viral pandemic modeling using a simulation. Project: Simulate a sample viral epidemic such as COVID-19 and observe the effects of mask-wearing, social distancing, quarantining, shut-downs and vaccines on infection rates and death rates.	2 wks
Unit 4 – Medications and Vaccines Topic: COVID-19 vaccine research, pharmaceutical synthesis and delivery, pharmaceutical drug production. Learn about different types of vaccines ranging from weakened virus to mRNA. Drug delivery methods and the bioengineer's role in pharmaceutical manufacturing/production. Project: Research a medication or vaccine and make a presentation to the class about how the medication works and discuss the side-effects and other trade-offs.	4 wks
Unit 5 – Genetic Engineering Topics: Genetic Engineering of Plants, Animals and uses in Medicine	1 wk
Unit 6 – Biomedical Devices Topics: Analog and digital signals, sampling and analysis. Using spreadsheets to help with data interpretation and modeling. Projects: - Measure heart rhythms and model them using polynomial equations. - Measure grip strength and analyze differences between left and right hands and compare with class data by using a spreadsheet to perform statistical data analysis. - Measure your reflex and the electrical signal causing neuromuscular contraction and compare with that of voluntary muscular contraction. - Take Electrocardiogram (EKG) measurements and analyze the resulting data.	3 wks
Final Exam	1 day