NGSS CORRELATIONS

BIOMEDICAL ENGINEERING

Crosscutting Concepts		Activity number
Structure and Function	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	2, 3, 4, 5, 8, 9
Scale, Proportion, and Quantity	Scientific relationships can be represented through the use of algebraic expressions and equations.	4
Stability and Change	Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.	7
Connections to Engineering, Technology, and Applications of Science	Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems	2, 3, 6, 7 , 9
	The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.	3, 5, 6, 7, 9
	All human activity draws on natural resources and has both short- and long-term consequences, positive as well as negative, for the health of people and the natural environment.	2, 3, 6, 7
Connections to the Nature of Science	Scientists and engineers are guided by habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.	6
Science and Engineering Practices		**Activity number**
Analyzing and Interpreting Data	Analyze and interpret data to determine similarities and differences in findings.	4, 5
Asking Questions and Defining Problems	Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.	1, 2, 3, 4, 5, 6, 9
	Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.	2

Science and Engineering Practices		Activity number
Constructing Explanations and Designing Solutions	Construct an explanation that includes qualitative or quantitative relationships between variables that predict or describe phenomena.	8
	Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.	4, 5, 9
	Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.	5, 7, 9
	Optimize performance of a design by prioritizing criteria, making trade-offs, testing, revising, and retesting.	4, 5, 9
Developing and Using Models	Develop a model to predict and/or describe phenomena.	8
	Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.	4, 5, 9
	Evaluate limitations of a model for a proposed object or tool.	4, 9
Engaging in Argument from Evidence	Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	5, 7
Using Mathematics and Computational Thinking	Use mathematical representations to describe and/or support scientific conclusions and design solutions.	4, 7, 9
	Create algorithms (a series of ordered steps) to solve a problem.	1
	Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.	7
Connections to the Nature of Science	Scientific knowledge is based on logical and conceptual connections between evidence and explanations.	8
Disciplinary Core Ideas		**Activity number**
Defining and Delimiting Engineering Problems (ETS1.A)	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.	1, 2, 3, 4, 6, 7, 8, 9
Defining and Delimiting Engineering Problems (ETS1.A)	A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	4, 5, 9
	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	4, 5, 7, 9
	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.	1, 2, 4, 5, 9
	Models of all kinds are important for testing solutions.	4, 5, 8, 9

Disciplinary Core Ideas		Activity number
Optimizing the Design Solution (ETS1.C)	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design.	4, 5, 9
	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	2, 4, 5, 9
Structure and Function (LS1.A)	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	5, 8, 9
Organization for Matter and Energy Flow in Organisms (LS1.C)	Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.	7
Performance Expectations		**Activity number**
Engineering Design (ETS1)	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS-ETS1-1)	3
	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)	7
	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-3)	5
	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)	9

COMMON CORE STATE STANDARDS CORRELATIONS

BIOMEDICAL ENGINEERING

Common Core State Standards – English Language Arts		Activity number
Reading in Science and Technical Subjects (RST)	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (RST.6-8.1)	3, 6
	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (RST.6-8.2)	3, 6
	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (RST.6-8.9)	3, 6
Speaking and Listening (SL)	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound and valid reasoning, and well-chosen details: use appropriate eye contact, adequate volume, and clear pronunciation. (SL.8.4)	4 , 5, 9
Writing in History/ Social Studies, Science, and Technological Subjects (WHST)	Draw evidence from informational texts to support analysis, reflection, and research. (WHST.6-8.9)	6
Common Core State Standards – Mathematics		**Activity number**
Mathematical Practice (MP)	Reason abstractly and quantitatively. (MP.2)	4, 5, 7
Ratios and Proportional Reasoning (RP)	Understand the concept of a ratio, and use ratio language to describe a ratio between two quantities. (6.RP.A.1)	4
	Use ratio and rate reasoning to solve real-world and mathematical problems. (6.RP.A.3)	4
Expressions and Equations (EE)	Solve multi-step, real-world and mathematical problems posed with positive and negative numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; assess the reasonableness of answers using mental computation and estimation strategies. (7.EE.B.3)	7