## MIDDLE SCHOOL (6th – 8th) ENGINEERING DESIGN

### Cardinal Newman Standards: Catholic Identity Integration

- **CS.S.712.IS2:** Demonstrate confidence in human reason and in one's ability to know the truth about God's creation and the fundamental intelligibility of the world.
(NGSS.MS.ETS1.1; ETS1.2; ETS1.3; ETS1.4)
- **CS.S.712.IS3:** Analyze how the pursuit of scientific knowledge, for utilitarian purposes alone or for the misguided manipulation of nature, thwarts the pursuit of authentic Truth and the greater glory of God.
(NGSS.MS.ETS1.1; ETS1.2; ETS1.3; ETS1.4)
- **CS.S.712.IS4:** Relate how the search for truth, even when it concerns a finite reality of the natural world or of man, is never-ending and always points beyond to something higher than the immediate object of study.
(NGSS.MS.ETS1.1; ETS1.2; ETS1.3; ETS1.4)
- **CS.S.712.IS7:** Describe humanity's natural situation in, and dependence upon, physical reality and how man carries out his role as a cooperator with God in the work of creation.
(NGSS.MS.ETS1.1; ETS1.2; ETS1.3; ETS1.4)
  **CS.S.712.DS2:** Share how natural phenomena have more than a utilitarian meaning and purpose and exemplify the handiwork of the Creator.
(NGSS.MS.ETS1.1; ETS1.2; ETS1.3; ETS1.4)

| Priority Skills | Supporting Skills |
|---|---|
| - 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.<br>- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.<br>- 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.<br>- 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. | - Understand the process of engineering design, and recognize that although there is a "best" approach to such design, each problem presents a unique set of challenges that must be overcome.<br>- Understand that perseverance is a key component of problem solving.<br>- Utilize data and objectivity to support ideas throughout the problem-solving process. |

## Essential Questions

- How can I identify success criteria for an engineering design consistently and accurately?
- How does my Catholic faith help me to objectively define problems that my knowledge of science can help to address?
- How can perseverance through failure lead to ultimate success?
- What makes a design "optimal"?

## Vital Vocabulary

- Analytics, Causation, Constraints, Correlation, Criteria, Data, Design, Engineering, Enhance, Evaluate, Generate, Intended (Effects), Iterative, Modify, Optimal, Precision, Principle, Proposal, Solution, Systematic, Unintended (Effects)

*Additional Resources:* Cardinal Newman Science Resources, Appendix E