



ENLIGHTIUM ACADEMY

Ignitia™ Career and Technical Education
Electives

Engineering and Design

Enlightium Academy invites you to open the door to career and college readiness with Career and Technical Education (CTE) courses from Alpha Omega Publications - Ignitia™.

These rigorous, hands-on courses for grades 7-12 promote critical thinking, emphasize problem solving, and encourage students to take responsibility for their own learning. With 24 CTE courses divided into six clusters, these courses put students on practical paths to post-graduate success.

Should you have any questions about the curriculum, please contact support@enlightiumacademy.com or call Enlightium Academy Customer Support at (866) 488-4818 ext. 2017.

If you have questions about technical support or product configuration, please see the information below for Alpha Omega Publications.

Alpha Omega Publications Technical Support

Alpha Omega Publications' technical support is Ignitia™'s full-service technical support system. We exist to promote and preserve our customers' satisfaction. Our services include:

- Technical Support
- Product Configuration and Update Management

Please use the following information to contact Alpha Omega Publications' technical support:

Online:

Access our helpful Technical Support website simply by clicking on the life preserver located in the upper-right corner of any screen in our program!

Telephone:

Toll Free: 1-877-251-6662
Monday –Friday 7 a.m. to 5 p.m. (CT)

ENGINEERING AND DESIGN

COURSE OVERVIEW

Engineering and Design is part of the STEM (Science, Technology, Engineering, and Mathematics) education and career path. By building real-world problem-solving and critical-thinking skills, students learn how to innovate and design new products and improve existing products. Students are introduced to the engineering design process to build new products and to the reverse engineering process, which enables engineers to adjust any existing product.

Parallels and analogies from Scriptural examples will firmly seat the course in Bible truth, since God is the master engineer, designer, and creator of everything. Popular topics and issues that are politically controversial will be explored from a Biblical perspective.

A second and equally important emphasis will address how fluid power is used by engineers to make difficult maneuvers easier, increasing efficiency and minimizing effects on the environment. Students will then identify how engineering and design have a direct impact on environmental sustainability and economic greening, with Bible principles incorporated when appropriate. Finally, students will incorporate the engineering design process, environmental life cycle, and green engineering principles to create a decision matrix to learn how to solve environmental issues, while identifying how following God's original principles would have avoided producing those issues in the first place.

Objectives:

- Understand the basic STEM requirements of engineers and the skills required for the occupation.
- Define and understand how forces are transmitted with fluid systems to build efficiency and increase sustainability. With this knowledge, students can solve a problem with a new design solution using fluid power.
- Utilize sketching skills and techniques to produce detailed sketches of components in the design of a real-world object to scale. This allows students to determine the feasibility of a product or design.
- Use the engineering design process and reverse engineering techniques and apply them to a design. They will be able to create and use decision matrices to make design decisions based on logic and analysis. Students will be able to identify and research environmental issues and challenges with respect to energy and air quality.
- Identify and analyze the environmental life cycle of a product or process to solve sustainability challenges for social and industrial environmental issues.

ENGINEERING AND DESIGN	
UNIT 1: INTRODUCTION TO ENGINEERING AND DESIGN AND THE DESIGN PROCESS	
Assignment Titles	
1. Course Overview	10. Project: Researching Materials Designs
2. Design Opportunities All Around Us	11. Application of Materials
3. Design Improvements	12. Project: Designing a Destructive Test
4. Project: Creating a Product Discussion Forum	13. Quiz 2: Fundamentals of Engineering
5. Improvements of Everyday Items	14. Project: Special Project
6. Project: Model or Prototype Suggestion Presentation	15. Test
7. Quiz 1: Introduction to Design Opportunities	16. Course Project Part 1: Identifying the Product or Process
8. Basic Engineering Concepts	17. Glossary and Credits
9. Choosing Materials for Design	

ENGINEERING AND DESIGN
UNIT 2: FLUID SYSTEMS: ENERGY AND POWER TECHNOLOGIES IN ENGINEERING

Assignment Titles

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| 1. Fluid Power Systems | 9. Efficient Fluid Power Designs |
| 2. Fluid Power Devices | 10. Designing a Fluid Power Lifting System |
| 3. Project: Researching a Fluid Power System Goal | 11. Project: Designing a Fluid Power Lift System |
| 4. Designing Fluid Power Systems for Future Developments | 12. Quiz 2: Fluid Power Applications and Capabilities |
| 5. Project: Creating a Fluid Power System for the Future | 13. Project: Special Project |
| 6. Quiz 1: Introduction to Fluid Power | 14. Test |
| 7. Common Applications for Fluid Power Systems | 15. Course Project Part 2: Incorporating a Fluid Power System |
| 8. Project: Identifying Fluid Power in Daily Life | 16. Glossary and Credits |

ENGINEERING AND DESIGN
UNIT 3: MODELING AND SKETCHING

Assignment Titles

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| 1. Introduction to Technical Sketching and Drawing | 9. Project: Researching Model Uses in Remote or Dangerous Locations |
| 2. Project: Interview an Engineer About Sketching | 10. Designing a Sketch Model |
| 3. Geometric Shapes and Solids in Engineering | 11. Project: Presenting a Sketch Model of a Designed Pet Toy |
| 4. Drawing to Scale | 12. Quiz 2: Sketch Modeling |
| 5. Project: Creating a Technical Sketch of an Everyday Object to Scale | 13. Project: Special Project |
| 6. Quiz 1: Introduction to Design and Technical Sketches | 14. Test |
| 7. The Applications for Modeling in Engineering | 15. Course Project Part 3: Designing a Sketch Model |
| 8. Modeling and Prototypes | 16. Glossary and Credits |

ENGINEERING AND DESIGN
UNIT 4: REVERSE ENGINEERING

Assignment Titles

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| 1. Reverse Engineering: Visual Analysis | 10. Calculating the Process: Materials, Time, and Cost for Improvement |
| 2. Reverse Engineering: Functional Analysis | 11. Project: Researching Materials, Time, and Cost for Product Modifications |
| 3. Project: Creating a Function Structure Diagram or Product Teardown Chart | 12. Quiz 2: Using Reverse Engineering for Product Improvement |
| 4. Reverse Engineering: Structural Analysis | 13. Project: Special Project |
| 5. Project: Creating a Morphological Matrix | 14. Test |
| 6. Quiz 1: Introduction to Reverse Engineering | 15. Course Project Part 4: Calculating the Process: Materials, Time, and Cost Analyses |
| 7. Finding the Product: The Reverse Engineering and Design Process Applied | 16. Glossary and Credits |
| 8. Implementing the Procedure: Reverse Engineering a Product | |
| 9. Project: Reverse Engineering Documentation and Presentation | |

ENGINEERING AND DESIGN
UNIT 5: ENGINEERING TO IMPROVE SUSTAINABILITY

Assignment Titles

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| 1. Environmental Engineering Introduction | 10. Incorporating Green Engineering Principles |
| 2. Project: Researching a Local Sustainability Issue | 11. Project: Creating a Decision Matrix for an Environmental Issue |
| 3. Energy and Air Quality | 12. Quiz 2: Environmental Life Cycle and Green Engineering Design |
| 4. Green Buildings and Green Initiatives | 13. Project: Special Project |
| 5. Project: LEED Ratings for Building Construction | 14. Test |
| 6. Quiz 1: Introduction to Environmental Engineering | 15. Course Project Part 5: Incorporating Green Engineering Principles |
| 7. Environmental Assessment and Impacts | 16. Glossary and Credits |
| 8. Project: Researching Life Cycles for Assessment | |
| 9. Green Design Principles: Systems and Environment | |

ENGINEERING AND DESIGN
UNIT 6: COURSE PROJECT, REVIEW, AND EXAM

Assignment Titles

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| 1. Course Project Part 6: Conducting a Life Cycle Analysis | 2. Course Review |
| | 3. Exam |