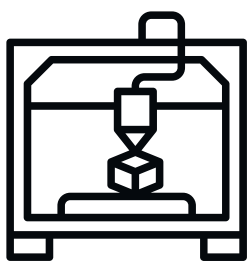
# Additively Manufacturing Maritime Solutions



How can 3D printers be utilized to design digital and physical prototypes for the development of industrial products?

**Suggested Equipment Skill Level**

Intermediate User

**Equipment Skills**

3D Design

**Career & Skillset Connections**

Industrial Product Designer

-Design Thinking
-Problem Solving
-Knowledge of Material Properties

**Project Guiding Themes**

-Engineering design process
-Designing in 3D modeling software
-Designing a prototype that meets multiple constraints

**Suggested Software & Materials**

-3D Modeling Software
TinkerCAD, OnShape, Autodesk Fusion 360, Autodesk Inventor, Solidworks

-Recyclable materials

## Aligned VDOE CTE Course(s) and Competencies

**Technical Drawing and Design**
36-Weeks

**Materials and Processes Technology**
36-Weeks

**Manufacturing Systems I**
36-Weeks

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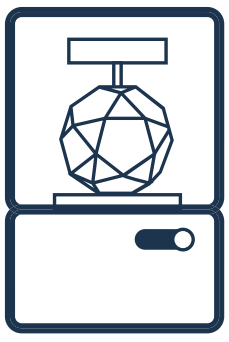

3D Printing- Intermediate Skill Level

How can additive manufacturing be utilized to design digital and physical prototypes for the development of industrial products?

## Project Problem & Career Prompt

As an Industrial Product Designer, who specializes in designing heavy machinery, you/your team have just received a new multimillion-dollar contract! The new customer, Repairs and Refits by the Sea, is a shipyard that builds and repairs large marine vessels. They have come across some design flaws in the different maritime deck equipment purchased from a different company, such as cranes, winches, and lifting and handling equipment. These types of equipment are exposed to the elements on the decks of vessels (saltwater, inclement weather, etc.). Repairs and Refits has tasked you/your team to create a new design of one of the maritime deck equipment to be better protected from the weather and natural wear and tear. As an Industrial Product Designer, you/your team will use design thinking, problem solving skillsets, and knowledge of material properties to create a digital and physical prototype of the desired maritime deck equipment by the deadline.

## Project Background & Resources

Types of deck equipment on marine vessels:

https://maritimepage.com/deck-machinery-in-ship-types-and-use-onboard/

## Investigative Questions

What materials are found on marine vessels?

What are the types of maritime deck equipment?

How do the elements exposed to the deck equipment affect their integrity?

## Project Criteria

-Consider how the design will be improved for weathering, inclement weather, and use on seaworthy vessels

-Choose 1 maritime deck equipment to improve design of

-Physical prototype must visually resemble the maritime deck equipment (to the best of you/your team's ability)

-Maritime deck equipment must be designed with at least ONE 3D printed part developed by you/your team and at least TWO other materials

-Final physical prototypes must be completed prior to project deadline

## Project Constraints

-3D printer must be used for at least one physical prototype part

-Recyclable material must be used for other materials to build physical prototype

-3D printed part must be designed by you/your team in CAD of other 3D modeling software (cannot use prefabricated 3D model as the part to be printed)

-No constraints on prototype size

## Suggested Pacing

1-2 Days of research (equipment, conditions at sea, etc.)

1-2 Days of design and identifying 3D printed part versus other materials

3-4 Days of 3D modeling, 3D printing, and construction

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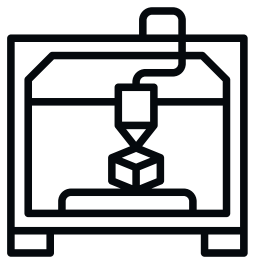
## 3D Printing



## Career & Skill Set Connections

### Industrial Product Designer

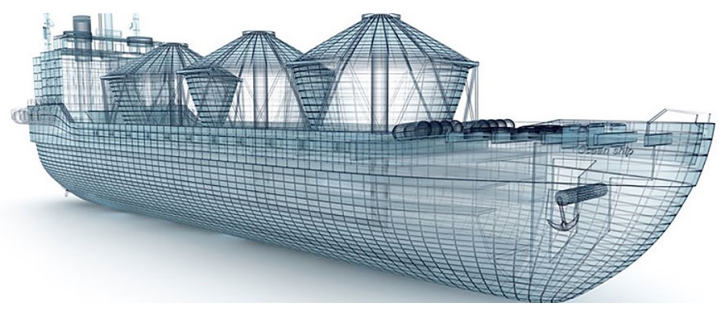
Industrial Product Designers are responsible for developing concepts of manufactured products. They create solutions that are innovative, practical, and suitable for manufacturing.

### Essential Skills

*Technical and Creative
*IT Skills (CAD)
*Mechanical
*Problem Solving
*Oral and Written Communication Skills

### Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree
or
Master's degree

## Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

### Technical Drawing & Design

Introducing the Design Process

Apply the engineering design process, including prototyping and modeling.

Analyze design solutions.

Refine design solutions.

Producing Technical Drawings

Create solutions, using CAD.

Producing Prototypes

Produce a prototype, using a 3D printer.

### Manufacturing Systems I

Explore Materials and Processes

Describe additive processes

Distinguish among materials used in the manufacturing process

Use materials to make a product

Understanding Production Processes

Explain the product-development process

Describe the engineering design process

Apply technology to produce a prototype

Use the engineering design process to plan production

Describe production planning in manufacturing

Evaluate the process and the prototype

### Materials & Processes Technology

Exploring additive and Subtractive Manufacturing

Identify computer-driven additive manufacturing processes

Generate models to be converted into machine-compatible digital files

Create a product using computer-driven additive or subtractive processes

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# Project Management Plan

Team Member Roles

Team Goals & Timelines

Team Member Tasking

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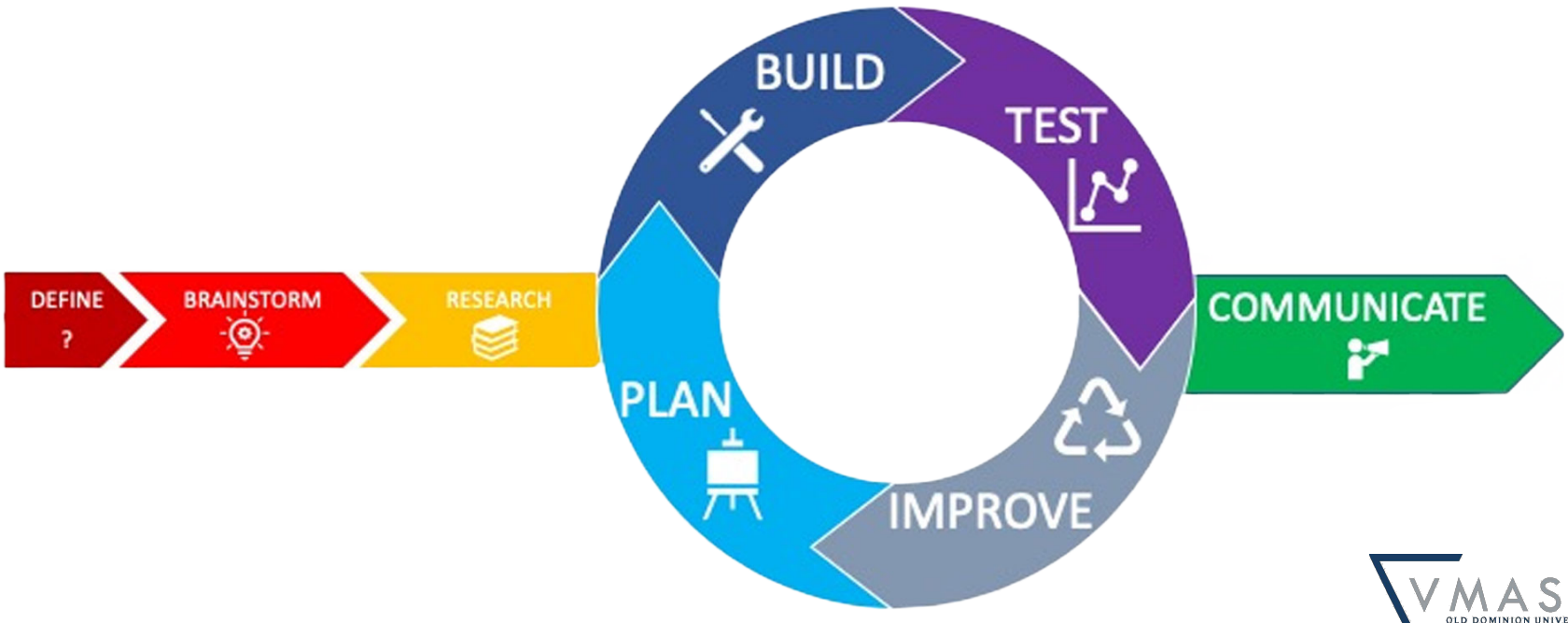
# Sketches & Design Planning

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# Notes

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