Course Name

Revised UBD Curriculum
Egg Harbor Township High School
Business and Computer Science Department

CTE

Career and Technical Education

Created By: Industrial Arts Teachers
Coordinated By: Dr. Carmelita Graham

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DISTRICT MISSION STATEMENT

Our mission in the Egg Harbor Township School District is to partner with the student, family, school, and community to provide a safe learning environment that addresses rigorous and relevant 21st Century standards and best practices which will develop academic scholarship, integrity, leadership, citizenship, and the unique learning style of students, while encouraging them to develop a strong work ethic and to act responsibly in their school community and everyday society.

CAREER AND TECHNICAL EDUCATION

Mission:

New Jersey's Office of Career and Technical Education seeks to prepare students for career opportunities of the 21st century, succeed as global citizens and support healthy economic growth for New Jersey. Career and Technical Education prepares students to succeed as global citizens for career opportunities for the 21st Century and to support healthy economic growth within the state.

INTRODUCTION

The most precious resource teachers have is time. Regardless of how much time a course is scheduled for, it is never enough to accomplish all that one would like. Therefore, it is imperative that teachers utilize the time they have wisely in order to maximize the potential for all students to achieve the desired learning.

High quality educational programs are characterized by clearly stated goals for student learning, teachers who are well-informed and skilled in enabling students to reach those goals, program designs that allow for continuous growth over the span of years of instruction, and ways of measuring whether students are achieving program goals.

EGG HARBOR TOWNSHIP SCHOOL DISTRICT CURRICULUM TEMPLATE

The Egg Harbor Township School District has embraced the backward-design model as the foundation for all curriculum development for the educational program. When reviewing curriculum documents and the Egg Harbor Township curriculum template, aspects of the backward-design model will be found in the stated enduring *understandings/essential questions, unit assessments,* and *instructional activities*. Familiarization with backward-design is critical to working effectively with Egg Harbor Township's curriculum guides.

GUIDING PRINCIPLES: WHAT IS BACKWARD DESIGN?

WHAT IS UNDERSTANDING BY DESIGN?

"Backward design" is an increasingly common approach to planning curriculum and instruction. As its name implies, "backward design" is based on defining clear goals, providing acceptable

evidence of having achieved those goals, and then working 'backward' to identify what actions need to be taken that will ensure that the gap between the current status and the desired status is closed.

Building on the concept of backward design, Grant Wiggins and Jay McTighe (2005) have developed a structured approach to planning programs, curriculum, and instructional units. Their model asks educators to state goals; identify deep understandings, pose essential questions, and specify clear evidence that goals, understandings, and core learning have been achieved.

Program based on backward design use desired results to drive decisions. With this design, there are questions to consider, such as: What should students understand, know, and be able to do? What does it look like to meet those goals? What kind of program will result in the outcomes stated? How will we know students have achieved that result? What other kinds of evidence will tell us that we have a quality program? These questions apply regardless of whether they are goals in program planning or classroom instruction.

The backward design process involves three interrelated stages for developing an entire curriculum or a single unit of instruction. The relationship from planning to curriculum design, development, and implementation hinges upon the integration of the following three stages.

Stage I: Identifying Desired Results: Enduring understandings, essential questions, knowledge and skills need to be woven into curriculum publications, documents, standards, and scope and sequence materials. Enduring understandings identify the "big ideas" that students will grapple with during the course of the unit. Essential questions provide a unifying focus for the unit and students should be able to answer more deeply and fully these questions as they proceed through the unit. Knowledge and skills are the *"stuff"* upon which the understandings are built.

Stage II: Determining Acceptable Evidence: Varied types of evidence are specified to ensure that students demonstrate attainment of desired results. While discrete knowledge assessments (e.g.: multiple choice, fill-in-the-blank, short answer, etc…) will be utilized during an instructional unit, the overall unit assessment is performance-based and asks students to demonstrate that they have mastered the desired understandings. These culminating (summative) assessments are authentic tasks that students would likely encounter in the real-world after they leave school. They allow students to demonstrate all that they have learned and can do. To demonstrate their understandings students can explain, interpret, apply, provide critical and insightful points of view, show empathy and/or evidence self-knowledge. Models of student performance and clearly defined criteria (i.e.: rubrics) are provided to all students in advance of starting work on the unit task.

Stage III: Designing Learning Activities: Instructional tasks, activities, and experiences are aligned with stages one and two so that the desired results are obtained based on the identified evidence or assessment tasks. Instructional activities and strategies are considered only once stages one and two have been clearly explicated. Therefore, congruence among all three stages can be ensured and teachers can make wise instructional choices.

At the curricular level, these three stages are best realized as a fusion of research, best practices, shared and sustained inquiry, consensus building, and initiative that involves all stakeholders. In this design, administrators are instructional leaders who enable the alignment between the curriculum and other key initiatives in their district or schools. These leaders demonstrate a clear purpose and direction for the curriculum within their school or district by providing support for implementation, opportunities for revision through sustained and consistent professional development, initiating action research activities, and collecting and evaluating materials to ensure alignment with the desired results. Intrinsic to the success of curriculum is to show how it aligns with the overarching goals of the district, how the document relates to district, state, or national standards, what a high quality educational program looks like, and what excellent teaching and learning looks like. Within education, success of the educational program is realized through this blend of commitment and organizational direction.

INTENT OF THE GUIDE

This guide is intended to provide teachers with course objective and possible activities, as well as assist the teacher in planning and delivering instruction in accordance with the New Jersey Core Curriculum Content Standards. The guide is not intended to restrict or limit the teacher's resources or individual instruction techniques. It is expected that the teacher will reflectively adjust and modify instruction and units during the course of normal lessons depending on the varying needs of the class, provided such modified instruction attends to the objectives and essential questions outlined below.

Unit Name: Safety and Careers in Engineering **Time Frame:** 6-8 Weeks

UNIT

Subject: CAD - Engineering Design Country: **US.**

Course/Grade: 9th - 12th State/Group: **NJ**

School:

UNIT SUMMARY: The students will be introduced to Careers in Engineering

UNIT RESOURCES:

Internet Resource Links:

http://www.discovere.org/discover-engineering/engineering-careers

http://educatingengineers.com/career-specialties

http://www.safetyinengineering.com/

https://sites.google.com/a/dcsdk12.org/christopher-gray-engineering/course-1/shop-safety

https://quizlet.com/156799946/engineering-safety-rules-flash-cards/

STAGE ONE

GOALS:

Understand appropriate safety measures when applying Engineering design.

Identify careers in Engineering

ENDURING UNDERSTANDING:

There are a variety of career paths in engineering. Safety is the number one priority when working in the Engineering lab.

ESSENTIAL QUESTIONS:

What careers are available for Engineers? What role does safety play in Engineering design. What are appropriate safety measures when applying Engineering design?

KNOWLEDGE AND SKILLS

STANDARDS:

CRP10. Plan education and career paths aligned to personal goals.

CRP4. Communicate clearly and effectively and with reason

CRP11. Use technology to enhance productivity.

9.2.12.C.1 Review career goals and determine steps necessary for attainment.

9.2.12.C.3 Identify transferable career skills and design alternate career plans.

9.2.12.C.4 Analyze how economic conditions and societal changes influence employment trends and future education. 9.2.12.C.5 Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.

9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

9.3.12.AC- DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST- SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation

8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.

STAGE TWO

PERFORMANCE TASKS

Engineering career project

Safety review and assessment

OTHER EVIDENCE

STAGE THREE

LEARNING PLAN:

Lecture

Group Work

Individual Projects

Career Presentations

Guest Speakers

Videos - Safety and Career

Safety Assessment

Unit Name: Introduction to Engineering **Time Frame:** 4-6 Weeks

UNIT

Subject: CAD - Engineering Design Country: **US.**

Course/Grade: 9th - 12th State/Group: **NJ**

School:

UNIT SUMMARY: The students will be introduced to the Engineering Design process and will use the Engineering design process to come up with a solution to solve a problem

UNIT RESOURCES

TinkerCad

AutoCad

Mojo 3D Printer

Engineer's Notebook

Project planning guide

Internet Resource Links:

https://www.tinkercad.com/

STAGE ONE

GOALS

ENDURING UNDERSTANDING: Engineering involves multiples steps. Engineering has played a major role in the advances in society. Engineering designs can be used to solve a problem.

ESSENTIAL QUESTIONS: In what ways does engineering design impact the world that we live in?

KNOWLEDGE AND SKILLS

STANDARDS:

CRP2. Apply appropriate academic and technical skills.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

9.3.12.AC- DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST- SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation

8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

STAGE TWO

PERFORMANCE TASKS

Complete history of engineering project

Complete introduction to engineering design activity

Engineer's notebook

Students will use Tinkercad software to create prototype design

Students will use 3D printer to print prototype design

OTHER EVIDENCE

STAGE THREE

LEARNING PLAN:

Informal survey of Engineering
Review of Engineering Process
Step- by- step explanation of process
Identify Problem
Research
Develop Solutions
Construct Prototype
Evaluate Solution and Redesign if needed
Application of Engineering Process
Students will apply Engineering Process to a simple problem
Step-by-step guidance with teacher
Students will apply Engineering Process to a problem
with less supervision
Student will apply Engineering Process to a more complex problem
Provide students with a realistic, attainable, possible solution
Present Power Point Presentation to class and explain in detail

Unit Name: Design World in 3D **Time Frame:** 6-8 Weeks

UNIT

Subject: CAD - Engineering Design Country: **US.**

Course/Grade: 9th - 12th State/Group: **NJ**

School:

UNIT SUMMARY: The students will be introduced to 3D design, modeling, and prototyping

UNIT RESOURCES

TinkerCad

Google Sketchup

AutoCad

Mojo 3D Printer

Engineer's Notebook

Project planning guide

Internet Resource Links:

https://www.tinkercad.com/learn/

https://www.sketchup.com/

http://www.computeraideddesignguide.com/autocad-exercises/

STAGE ONE

ENDURING UNDERSTANDING: Models can be used to depict large scale projects. The use of small scale models can impact long-term costs.

ESSENTIAL QUESTIONS: How does 3D printing impact the design process?

KNOWLEDGE AND SKILLS

GOALS AND STANDARDS:

CRP2. Apply appropriate academic and technical skills.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP12. Work productively in teams while using cultural global competence.

9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

9.3.12.AC- DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST- SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation

8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

STAGE TWO

PERFORMANCE TASKS

Complete history of Engineering project

Complete introduction to Engineering design activity

Log project progress in an Engineer's notebook

Design a 3D model using Autocad, TinkerCad, Google Sketchup

Refine model

Print and test 3D designed model

OTHER EVIDENCE

STAGE THREE

LEARNING PLAN:

Design a product that will assist someone who is physically challenged with completing an everyday task

Test out the product and get peer feedback on the product

Redesign the product

Identify a problem with a current classroom or learning space

Create a model of a classroom or learning space in a 21st century school

3D print the learning space

Unit Name: Design Challenge -Mechanical Engineering **Time Frame:** 6-8 Weeks

UNIT

Subject: Mechanical Engineering and Principles of Design Country: **US.**

Course/Grade: 9th - 12th State/Group: **NJ**

School:

UNIT SUMMARY: The students will be introduced to mechanical engineering and the principles of design

UNIT RESOURCES

AutoCad

TinkerCad

Internet Resource Links:

STAGE ONE

GOALS:

ENDURING UNDERSTANDING:

Good design can make processes easier. Programming and controls can be used to manipulate operation. Design can be improved to make processes easier. The design loop can be cyclical.

ESSENTIAL QUESTIONS:

How can coding and robotics influence engineering design? How can my design be redesigned to improve functionality?

KNOWLEDGE AND SKILLS

STANDARDS:

CRP2. Apply appropriate academic and technical skills.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP12. Work productively in teams while using cultural global competence.

9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

9.3.12.AC- DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST- SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation

8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

STAGE TWO

PERFORMANCE TASKS

Discuss the principles of good design

Create a prototype the will solve a design problem

Design an obstacle course for the Lego robot to navigate

Program Lego robots

Complete an Engineer's notebook

OTHER EVIDENCE

STAGE THREE

LEARNING PLAN:

Introduction to Mechanical Engineering

- **Show videos about ancient civilization and their advancement in Engineering**

- **Students will construct an automatic door with the use of Lego's**

- **Students will develop an automatic door [like doors at grocery stores]**
- **Students will utilize the concept of gears and pulleys**
- **Students will utilize sensors**
- **Students will program required components**
- **Students will construct a Lego vehicle that will climb and perform task on a prepared course**
- **Students will research design, gears, motors and build them**
- **Students will program vehicle to complete obstacle course**

Curriculum Resources - Differentiated Instruction

Special Education Interventions in General Education

Visual Supports
Extended time to complete tests and assignments
Graphic Organizers
Mnemonic tricks to improve memory
Study guides
Use agenda book for assignments
Provide a posted daily schedule
Use of classroom behavior management system
Use prompts and model directions
Use task analysis to break down activities and lessons into each individual step needed to complete the task
Use concrete examples to teach concepts
Have student repeat/rephrase written directions
Heterogeneous grouping

Resources:

Do to Learn:
http://www.do2learn.com/

Sen Teacher:
http://www.senteacher.org/

Intervention Central:
http://www.interventioncentral.org/

Learning Ally:
https://www.learningally.org/

English Language Learners Interventions in Regular Education

Resources:

FABRIC - Learning Paradigm for ELLs (NJDOE)
www.nj.gov/education/bilingual/pd/**fabric**/**fabric**.pdf

Guide to Teaching ELL Students
http://www.colorincolorado.org/new-teaching-ells

Edutopia - Supporting English Language Learners
https://www.edutopia.org/blog/strategies-and-resources-supporting-ell-todd-finley

Reading Rockets
http://www.readingrockets.org/reading-topics/english-language-learners

Gifted and Talented Interventions in Regular Education
Resources:

Who are Gifted and Talented Students
http://www.npr.org/sections/ed/2015/09/28/443193523/who-are-the-gifted-and-talented-and-what-do-they-need

Hoagies Gifted Education Page
http://www.hoagiesgifted.org/programs.htm

21st Century Learning
Resources:

Partnership for 21st Century Learning
http://www.p21.org/

Career Ready Practices (NJDOE)
http://www.nj.gov/education/cte/hl/CRP.pdf