Course Title
Aerospace Engineering

Course Description: Aerospace Engineering (AE) is the study of the engineering discipline which develops new technologies for use in aviation, defense systems, and space exploration. The course explores the evolution of flight, flight fundamentals, navigation and control, aerospace materials, propulsion, space travel, orbital mechanics, ergonomics, remotely operated systems and related careers. In addition the course presents alternative applications for aerospace engineering concepts.

Desired Results (Stage 1)

Established Competencies

Students will be able to…

1. Develop an understanding of the characteristics and scope of technology.
2. Develop abilities to apply the design process to aerospace engineering problems.
3. Develop an understanding of the cultural, social, economic, and political effects of technology.
4. Utilize an engineering notebook to show proper documentation of entire design process for a variety of course projects.
5. Identify and define vocabulary associated with aerospace engineering field.
6. Apply and adapt a variety of appropriate strategies to solve problems; monitor and reflect on the process of mathematical problem solving.
7. Develop an understanding of motion and forces, conservation of energy and increase in disorder, and interactions of energy and matter.
8. Develop an understanding of energy in the earth system.

Acquisition

Students will know…

- How aerospace engineering has affected society.
- What type of education and careers are associated with aerospace engineering.
- The physics associated with flight.
- ~~The physics associated with flight.~~
- How the design process is used in the aerospace engineering field.

Students will be skilled at…

- Critical Thinking
- Problem Solving

Evidence (Stage 2)	
Evaluative Criteria	**Assessment Evidence**
Rubrics Test/Quizes	*Formative/Summative Assessments* *Homework* *Classroom Assignments* *Projects*

Course Title
Aerospace Engineering
Unit 1: Introduction to Aerospace

Course Description: Aerospace Engineering (AE) is the study of the engineering discipline which develops new technologies for use in aviation, defense systems, and space exploration. The course explores the evolution of flight, flight fundamentals, navigation and control, aerospace materials, propulsion, space travel, orbital mechanics, ergonomics, remotely operated systems and related careers. In addition the course presents alternative applications for aerospace engineering concepts.

Desired Results (Stage 1)

Established Competencies

Students will be able to…

1. Develop an understanding of the characteristics and scope of technology.
2. Develop abilities to apply the design process to aerospace engineering problems.
3. Develop an understanding of the cultural, social, economic, and political effects of technology.
4. Utilize an engineering notebook to show proper documentation of entire design process for a variety of course projects.
5. Identify and define vocabulary associated with aerospace engineering field.
6. Apply and adapt a variety of appropriate strategies to solve problems; monitor and reflect on the process of mathematical problem solving.
7. Develop an understanding of motion and forces, conservation of energy and increase in disorder, and interactions of energy and matter.
8. Develop an understanding of energy in the earth system.

Acquisition

Students will know…

- The role technology and society have played on the evolution of flight.
- The role the evolution of flight has played in the culture of society.
- The physics associated with flight.
- How important technology is to a navigator.
- Risks present during space flight.

Students will be skilled at…

- Critical Thinking
- Problem Solving

Evidence (Stage 2)	
Evaluative Criteria	**Assessment Evidence**
Rubrics Test/Quizes	*Formative/Summative Assessments* *Homework* *Classroom Activities/Assignments* *Projects*

Aerospace Engineering – Competency #2: **Develop abilities to apply the design process to aerospace engineering problems.**				
Skill Assessed	1-Novice	2-Developing	3-Effective	4 - Advanced
Design Process	Poor Evidence of Design Process. No steps applied to Design Challenge Problems	Fair Evidence of Design Process. Some steps applied to Design Challenge Problems	Good Evidence of Design Process. Most steps applied to Design Challenge Problems	Excellent Evidence of Design Process. All steps applied to Design Challenge Problems

Aerospace Engineering - #4: **Utilize an engineering notebook to show proper documentation of entire design process for a variety of course projects.**				
Skill Assessed	1-Novice	2-Developing	3-Effective	4 - Advanced
Engineering Notebook: Journal entries	Journal entries are confusing, incomplete, or reflect poor sentence structure. Entries are not dated and many details necessary for creating initial sketches are missing.	Journal entries are well-written but are missing details. Information is not recorded in a logical order and is not enough to create initial sketches. The creation of initial sketches cannot be validated.	Journal entries are well-written but are missing details. All journal entry dates have information recorded. Information is recorded in a logical order and is enough to create initial sketches.	Journal entries are well-written in complete sentences and are dated. All entries are complete. Entries have the information structured in a usable format. Information for the design of the project is well- documented and validates creation of initial sketches.
Engineering Notebook: Project notebook entries	Project notebook entries are confusing, incomplete, and do not use proper notation. Entries are not dated and many details necessary for using the notebook effectively are missing.	Project notebook entries are written but are missing details or lacking proper notation. Information is not recorded in a logical order and is not enough to create initial sketches. Pictures, symbols, or diagrams are used but are irrelevant to the project.	Project notebook entries are well-written but are missing 1 or 2 details. Information is recorded in a logical order and is enough to create initial sketches. Pictures, symbols, or diagrams are used and are incomplete.	Project notebook entries are well-written in complete sentences and are dated. All entries are complete with appropriate sketches, pictures, symbols, and diagrams. Entries have the information structured in a usable format. Notes are provided that explain why a strategy or process was used.

Aerospace Engineering – Competency #5: **Identify, define, and correctly use vocabulary associated with aerospace engineering field.**				
Skill Assessed	1-Novice	2-Developing	3-Effective	4 - Advanced
Vocabulary	Student does not recognize vocabulary or use vocabulary correctly	Student recognizes and can define some vocabulary. Student misuse vocabulary terms.	Student can recognize, define and use most vocabulary terms correctly.	Student recognizes, defines, and uses all vocabulary terms correctly.

Aerospace Engineering – Competency #6: **Apply and adapt a variety of appropriate strategies to solve problems; monitor and reflect on the process of mathematical problem solving**				
Skill Assessed	1-Novice	2-Developing	3-Effective	4 - Advanced
Associations, Connections & Relationships	Student needs specific direction to make associations between known and unknown information.	Student can make associations between known and unknown information, but needs frequent guidance. Student tends to make incorrect associations or associations based on incorrect knowledge.	Student utilizes previous knowledge to build accurate associations between known and unknown information, but needs occasional cueing, clarification, or affirmation. Student can learn new knowledge to make associations, but needs prompting, cueing, or direction.	Student utilizes previous knowledge to build accurate associations between knowns and unknowns. Student can research and learn new knowledge to make associations Student can successfully explain the associations. Student can make new associations (create new knowledge, genuine synthesis).
Organization	Student needs to have the problems explained Student needs specific direction to identify parts of the problem Student needs specific direction to use appropriate tools (writing, drawing, acting, etc.) to organize known and unknown information.	Student tries to comprehend the problem but needs cueing and/or clarification. Student often starts to solve before understanding the problem Student can attempt to break down the problem into smaller parts, but needs frequent guidance.	Student works toward comprehending the problem before starting to solve. Student can break down the problem into smaller parts. Student needs occasional cueing, clarification or affirmation.	Student works toward fully comprehending the problem before starting to solve. Student can effectively break the problem down into smaller parts. Student is cognizant of the processes used and can explain to others.

Aerospace Engineering Budget Considerations (Initial)

Product/Equipment	Quantity	Total Product Price
Force Plate	1	$210.38
ParkZone Night Vapor RTF RC Airplane Ultra-Micro Flyer – U1100	1	$129.99
Rocket Engine Test Bracket, accommodated size A, B, C and D engines, PASCO #ME-6617 1	1	$39.00
Carolina Visual Perception Kit.	1	$117.00
Wind Turbine Generator	5	$21.25
Slow Flyer Propeller, 8x3.8SF	5	$11.80
Slow Flyer Propeller, 8x6SF Part # 08060SF	5	$11.80
Propeller Adapter with set screw 4mm	5	$11.80
Logitech Joystick	10	$299.50
Porta- Pad II Launch Pad, AC Supply #2215	1	$9.89
Rocket Builder's Marking Guide, AC Supply #2227	1	$6.59
Table Top Foam Cutter with power supply	1	$87.95
Garmin eTrex Venture HC	5	$398.85
Microsoft Flight Simulator Verion X	10	$171.30
Estes A8-3 Model Rocket Motors Bulk Pack (24 ea) - 1781	1 – Pkg/24	$43.19
Estes Model Rocket Igniters (6 ea) - 302301	1 – Pkg/6	$3.29
Estes Model Rocket Recovery Wadding - 302274	2	$6.58
Estes Model Rocket AltiTrak Altitude Tracker - 302232	2	$26.38
Estes Alpha III E2X Model Rocket Launch Set - 1427	1	$19.67
Rod/Base Assemblies, Base Size, in.: 6 x 9, Rod Length, in.: 24	1	$18.35
Knife, Putty Stiff Blade, 1 1/4" Wide Blade, Hyde #02050	2	$4.50
Plastic body putty squeegee 4"	20	$99.80
PVC Pipes	1 set	$50.00
Teacher Training	1	?
	Course Total	***$1798.86***

Aerospace Engineering Budget Considerations (Yearly)

Product	*Quantity*	*Total Product Price*
105Epoxy Resin (Wicks Item# 105-A)	1 QT	$33.69
Slow Hardener (Wicks Item# 206-A)	1 Bottle	$17.26
2 Inch Fiberglass Tape (Wicks Item# 2X50-FGT)	1 Roll	$16.31
Mini Pump Set to be used with 105 resin and 205 or 206 hardeners (Wick Item# 300)	1 Set	13.96
Unidirectional S2 Glass 12" Reinforcement Tape (Wicks Item# SU300)	20	$75.60
Catapult construction kit (to make 1 catapult) AC Supply #Mid 7152	2	$35.98
Bulk pack of C6-5 Estes Model Rocket Engines, AC Supply #1789	1	$50.99
Bulk Pack of B6-4 Estes Model Rocket Engines, AC Supply # 1783	1	$43.79
Estes Model Rocket BT-50 Body Tube (3 pack) - 303086	7	$34.79
Estes Model Rocket NC-50 Nose Cone (5 pack) - 303162	4	$16.28
Estes Model Rocket Regular Motor Mount Kit - 303158	10 – Pkg/2	$44.99
Quest Model Rocket 14 Inch Parachute - 7810	20	$71.80
Estes Model Rocket Shock Cords and Mount Pack - 302278	10	$29.90
Modeling Clay	1	$8.86
Balsa Sheets/Sticks	4–Pkg/20	$75.00
2" x 24" x 96" Close cell blue construction foam	4	$171.80
Polyethylene sheet (Visqueen) 4 mil.	1	$9.90
	Yearly Course Total	***$750.90***