Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
Middle School Course of Study

Course Title	*Flight and Space Re-Write*	**Course Code**	*KT010*

Transcript Title:	*Flight and Space*	Grades Levels:	*8*	Board Adoption Date:	
Content Area:	***Engineering***	**GPA Scale:**	***4.0***	**Date Course Submitted:**	***3/27/18***
Credential Required:	*CTE*	Graduation Subject Areas:	*ELECTIVE*		
UC/CSU "A-G" Area Approvals:			School Site/person that wrote and submitted the course:	*TeWinkle/Candice Woods*	
Recommend Skills:	*Reading, Writing, Mathematics*				
Next course(s):	*Medical Detectives*				

Flight and Space

DATE: March 6, 2018

INDUSTRY SECTOR: Engineering and Architecture

PATHWAY: Engineering Design Pathway

CBEDS TITLE: Introduction to Engineering and Architecture (999)

CBEDS Code: 7700

HOURS:

Total	Classroom	Laboratory/CC/CVE
90 Hours	25 Hours	65 Hours

JOB TITLE	ONET CODES	JOB TITLE	ONET CODES
N/A	N/A		

COURSE DESCRIPTION: The exciting world of aerospace comes alive through the Flight and Space (FS) unit. Students explore the science behind aeronautics and use their knowledge to design, prototype, and test model rocket fuel and a glider. Custom-built simulation software allows students to experience space travel.

PREREQUISITES N/A

High School Name:	Site Prerequisite:
N/A	

A – G APPROVAL: ☐ Yes ☒ No ☐ Desired

ARTICULATION: N/A

High School Name:	College Name:	College Course Title:
N/A		

LEVEL: [x] **Introductory** [ ] **Concentrator** [ ] **Capstone**

CERTIFICATION: N/A

High School Name:	Embedded/Leads to:	Description:
N/A		

METHOD OF STUDENT EVALUATION:

- ✓ Pre and Post test
- ✓ Student Projects
- ✓ Written work
- ✓ Observation record of student performance
- ✓ Completion of assignments and worksheets

METHOD OF INSTRUCTION:

- ✓ Lecture
- ✓ Group and individual applied projects
- ✓ Demonstration
- ✓ Field Trips
- ✓ Guest Speaker

RECOMMENDED TEXTS:

PLTW Course Curriculum

MODEL CTE PATHWAY:
Exploratory PLTW Course

CALIFORNIA CAREER TECHNICAL EDUCATION MODEL CURRICULUM STANDARDS
California Department of Education CTE Standards website: http://www.cde.ca.gov/ci/ct/sf/ctemcstandards.asp

Advanced Manufacturing and Engineering
KNOWLEDGE AND PERFORMANCE ANCHOR STANDARDS

1.0 Academics
Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Engineering and Architecture academic alignment matrix for identification of standards.

2.0 Communications
Acquire and accurately use Engineering and Architecture sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)
2.1 Recognize the elements of communication using a sender–receiver model.
2.2 Identify barriers to accurate and appropriate communication.
2.3 Interpret verbal and nonverbal communications and respond appropriately.
2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and format.
2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

3.0 Career Planning and Management
Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)
3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
3.2 Evaluate personal character traits, such as trust, respect, and responsibility, and understand the impact they can have on career success.
3.3 Explore how information and communication technologies are used in career planning and decision making.
3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
3.7 Recognize the importance of small business in the California and global economies.
3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

4.0 Technology
Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Engineering and Architecture sector workplace environment. (Direct alignment with WS 11-12.6)
4.1 Use electronic reference materials to gather information and produce products and services.
4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
4.5 Research past, present, and projected technological advances as they impact a particular pathway.
4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

5.0 Problem Solving and Critical Thinking
Conduct short, as well as more sustained, research projects to create alternative solutions to answer a question or

solve a problem unique to the Engineering and Architecture sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)
5.1 Identify and ask significant questions that clarify various points of view to solve problems.
5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

6.0 Health and Safety
Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Engineering and Architecture sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)
6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.
6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
6.6 Maintain a safe and healthful working environment.
6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

7.0 Responsibility and Flexibility
Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Engineering and Architecture sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)
7.1 Recognize how financial management impacts the economy, workforce, and community.
7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
7.3 Understand the need to adapt to changing and varied roles and responsibilities.
7.4 Practice time management and efficiency to fulfill responsibilities.
7.5 Apply high-quality techniques to product or presentation design and development.
7.6 Demonstrate knowledge and practice of responsible financial management.
7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
7.8 Explore issues of global significance and document the impact on the Engineering and Architecture sector.

8.0 Ethics and Legal Responsibilities
Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)
8.1 Access, analyze, and implement quality assurance standards of practice.
8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Engineering and Architecture industry sector.
8.3 Demonstrate ethical and legal practices consistent with Engineering and Architecture sector workplace standards.
8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
8.5 Analyze organizational culture and practices within the workplace environment.
8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.

8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Engineering and Architecture sector laws and practices.

9.0 Leadership and Teamwork
Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)
9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills, as applied in groups, teams, and career technical student organization activities.
9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
9.4 Explain how professional associations and organizations and associated leadership develop¬ment and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
9.5 Understand that the modern world is an international community and requires an expanded global view.
9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
9.7 Participate in interactive teamwork to solve real Engineering and Architecture sector issues and problems.

10.0 Technical Knowledge and Skills
Apply essential technical knowledge and skills common to all pathways in the Engineering and Architecture sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11 -12.6)
10.1 Interpret and explain terminology and practices specific to the Engineering and Architecture sector.
10.2 Comply with the rules, regulations, and expectations of all aspects of the Engineering and Architecture sector. 10.3 Construct projects and products specific to the Engineering and Architecture sector requirements and expectations.
10.4 Collaborate with industry experts for specific technical knowledge and skills.

11.0 Demonstration and Application
Demonstrate and apply the knowledge and skills contained in the Engineering and Architecture anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the SkillsUSA career technical student organization.
11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Engineering and Architecture sector program of study.
11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
11.4 Employ entrepreneurial practices and behaviors appropriate to Engineering and Architecture sector opportunities.
11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

CR = Classroom LAB/CC = Laboratory/Shop/Community Classroom

I.	History of Flight and Space	CR	LAB/ CC	STANDARDS
	Activity 1.1: The Science of Flight: The Spirit of Innovation • Students will watch the video *The Science of Flight: The Spirit of Innovation*. This video will introduce them to the innovators of aviation, explore the technology that has advanced flight, and preview the next generations of **airplanes**. **Activity 1.2: Flying Machines** • Students will work in teams to build a model of an aerospace vehicle that they will safely fly or launch. Their flight test will be recorded so it can be used in an infomercial that their team will write during the next project. **Activity 1.3: Aerospace Infomerical** • Students will work in teams to create an infomercial to inform the audience about their aerospace vehicle.	6 Hrs	15 hrs.	**Academic:** **Reading:** AS.R.1,4 AS.W.2,4,6-8 AS.SL.2,4,5 AS.L.1,2,6 **Technology:** 7.6-8.C,D 8.6-8.E-G 11.6-8.K,L 17.6-8.H-K **Math:N/A** **Science:** MS.ETS.1.1,2 **CTE Anchor:** 2.0 4.0 5.0 6.0 7.0 9.0 10.0 11.0 **CTE Pathway:** C1.0 C2.0 C3.0 C10.0 C11.0
II.	**Aeronautics**	**CR**	**LAB/ CC**	**STANDARDS**
	Activity 2.1: Four Forces of Flight • Students will learn about the forces acting on an airplane during flight. This knowledge of these forces will help them to investigate atmospheric flight later in this unit. **Activity 2.2: Newton's Laws** • Students will learn how Newton's laws of motion affect an airplane during flight. **Activity 2.3: Airfoils, Lift, and Bernoulli's Principle** • Daniel Bernoulli, an eighteenth-century Swiss scientist, discovered that as the **velocity**of a **fluid** increases, its pressure decreases. What Bernoulli was able to show is what is sometimes called Bernoulli's law of pressure differential for fluids. Since air is a fluid, this pressure difference is important. During this activity, students will discover why.	10 Hrs	20 Hrs	**Academic:** **Reading:** AS.W.4,9 AS.SL.2 AS.L1,2,6 **Technology:** 2.6-8.N,P,Q,R 7.6-8.C,D 8.6-8.E-G 9.9-8.F,H 10.6-8.F,H 11.6-8.H-K 18.6-8.H **Math:** 7.RP.A.1,2,2c 7.NS.A.2,2a 7.EE.A.2 7.EE.B.4,4a **Science:**

	Activity 2:4 Tools of Aeronautics • Aeronautics can be defined as the art or science of flight or as the science of operating an aircraft. One part of aeronautics is the study of the motion of air and the way it interacts with objects in motion, such as an aircraft. Students will investigate the tools of aeronautics such as a wind tunnel. **Activity 2.5: Wind Tunnels** • When the Wright brothers were building their first airplane, many others before them had failed. The Wright brothers and others soon realized that in order for them to learn how to fly, they had to learn how air flowed over objects. The wind tunnel was the tool developed to experiment with air flowing over objects. Students will use a wind tunnel simulation that works exactly the same way that the Wright brothers' 1901 wind tunnel worked. **Activity 2.6: Airfoils** • Students will research the relationship between airfoil designs and the forcesacting on an airfoil. **Activity 2.7: Parts of an Aircraft** • The science of aeronautics defines the four forces of flight as lift, drag, weightand thrust. Students will learn about the parts of the airplane and its wings. **Activity 2.8: Propulsion Systems** • A propulsion system provides thrust, which is one of the four forces of flight. Students will analyze propulsion systems for airplanes and rockets.			MS.PS2.1,2,4 MS.PS3.4,5 MS.ETS.1-4 **CTE Anchor:** 2.0 4.0 5.0 6.0 7.0 9.0 10.0 11.0 **CTE Pathway:** C1.0 C2.0 C3.0 C4.0 C5.0 C7.0 C11.0
III.	**Traveling and Living in Space**	**CR**	**LAB/ CC**	**STANDARDS**
	Activity 3.1: Milestones in Space Exploration • In this activity students work as a team to research the past, present, and future of space exploration and then share their findings with their class. **Activity 3.2: Rocket into Space** • Can an airplane just fly into space? Of course it can't. Most people know that airplanes cannot fly in space, but few really know why. The reason is because airplanes need air to fly, and there is no air in space. Students use a rocket flight simulation program. **Activity 3.3: Living in Space** • The International Space Station (ISS) is a little "city in	5 Hrs	20 Hrs	**Academic:** **Reading:** AS.R.4 AS.W.4,9 AS.SL.2,5 AS.L.1,2,6 **Technology:** 2.6-8.N,P,Q,R,V 4.6-8.D,E,G 6.6-8.E,F 7.6-8.C,D 8.6-8.E,G 12.6-8.H,J 123.6-8.F,I 18.6-8.G,H

	space" orbiting 250 miles above the Earth. About the size of two football fields, the space station is a place where people from around the world can live and study in space over long periods.Students will complete simulated missions related to the ISS. **Activity 3.4: Weight and Mass on Mars** • The properties of weight and mass are often confused or used interchangeably. On Earth, because we are all operating in the same gravitational field, it often does not cause confusion when someone refers to their weight in kilograms or states a mass in pounds. But when we are operating in a gravitational field other than the Earth's, the distinction becomes more critical. Students will explore the weight of objects on various planets. **Activity 3.5: Mars Mini-rover Design Challenge** • In this activity, students will be assigned a **NASA** team, they will design a light-weight, mini-**rover** chassis to carry a small camera lens and provide an open container to store soil samples. In this stage of the design,students will use balloon propulsion to test the chassis. **Activity 3.6: Data Analysis** • How can we know if a design meets the design criteria consistently? How can we compare different design ideas against each other? Students will learn how to calculate summary statistics for a data set and represent the data visually using a box plot. **Activity 3.7: Mars Mini-rover Testing** • Students test their mini-rover design and collect data to analyze to improve the design.			**Math:** 7.EE.B.3 **Science:** MS.PS2.1 MS.ESS1.2 MS.ETS1.2,3,4 **CTE Anchor:** 2.0 4.0 5.0 7.0-11.0 **CTE Pathway:** C1.0 C3.0 C4.0 C8.0 C10.0 C11.0
IV.	**EMPLOYMENT PORTFOLIO**	**CR**	**LAB/ CC**	**STANDARDS**
	Students will prepare an update to their professional portfolio (lab book) A. Portfolio showcases best professional level work B. Portfolio is organized C. Research engineers/careers specific to content	4 hr ONGOING	10 hrs ONGOING	**Academic:** **Reading:** AS.R.1,4,7 AS.W.2,4,7 AS.SL.1,2,4 AS.L.1,2,6 **CTE Anchor:** 1.0 2.0 3.0 11.0 **CTE Pathway:** C11.0