CHSCTAA - Engineering & Technology Pathway

Curriculum Mapping/Pacing Guide

Foundations of Engineering

WEEK	UNIT CONTENT	LEARNING TARGET	STANDARDS	LESSONS/SKILLS	STEM ACTIVITIES	VOCABULARY	ASSESSMENTS
1,2	Unit 1 – Introduction to Engineering	Students will develop an understanding of engineering and technology and describe the principal fields of engineering specializations (ex. aeronautical, automotive, chemical, civil, industrial, mechanical, computer software, electrical, and biomedical) and identify associated career tracks.	STEM-FET-2.1 STEM-FET-2.2 STEM-FET-2.3 STEM-FET-2.4 STEM-FET-2.5 STEM-FET-3.8 STEM-FET-6.1 STEM-FET-8.1 STEM-FET-8.5 STEM-FET-9.1 STEM-FET-10.1 STEM-FET-10.2 STEM-FET-10.3 STEM-FET-10.4	● Engineering Notebooks ● What is Engineering? ● Early Engineering Disciplines ● Engineers from A to Z ● Engineering Design Process ● Technology Student Association (TSA) ○ TSA Scavenger Hunt	● STEM Activity – Team Building ○ Marshmallow Challenge ○ Card Shark ● STEM Activity – FlipGrid All About Me_Video https://flip.com/35603b03	1. Engineering 2. ABET 3. Design Process 4. Criteria 5. Constraints 6. Prototype 7. Critical Thinking	● Cell Phone Case Project/Presentation ● Engineering Inventions Project
3,4,5	Unit 2 – Civil Engineering	Students will learn about the history of technology and engineering and its impact on society in the past, present, and future.	STEM-FET-3.1 STEM-FET-3.3 STEM-FET-3.4 STEM-FET-3.5 STEM-FET-3.6 STEM-FET-3.7 STEM-FET-8.1 STEM-FET-8.5 STEM-FET-9.1	● Early Engineering Disciplines ● Engineering Timeline ● History of Civil Engineering ● Types of Bridges ● Calculating Forces Acting on a Bridge ○ Calculating Horizontal and Vertical Forces using Trigonometry (Sine & Cosine) ● Calculating Torque (Rotational Motion)	● STEM Activity – Build a Bridge in a Day! ● Tacoma Narrows Bridge Collapse: https://www.youtube.com/watch?v=NJ1Euoh6iBE	1. Tension 2. Compression 3. Arch Bridge 4. Beam Bridge 5. Cable-Stayed Bridge 6. Abutments 7. Force 8. Load 9. Vertical Force 10. Horizontal Force 11. Equilibrium	● Manila Folder Bridge Project ○ Bridge Proposal (Pratt Truss) ○ Bridge Blueprints ● Unit 1/2 Test – Introduction to Engineering & Early Engineering Disciplines

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						12. Torque	
6,7	Unit 3 – Mechanical Forces, Work and Power	Students will learn how to calculate Work, Kinetic Energy Potential Energy and Power.	STEM-FET-8.1 STEM-FET-8.2 STEM-FET-8.2 STEM-FET-8.3 STEM-FET-8.4 STEM-FET-8.5 STEM-FET-9.1	● Newton's Laws of Motion ● Work, Kinetic Energy, Potential Energy, Power ● Conservation of Energy ● Momentum ● Weight, Friction and Equilibrium		1. Force 2. Mass 3. Acceleration 4. Gravity 5. Momentum 6. Work 7. Kinetic Energy 8. Potential Energy 9. Power 10. Weight 11. Friction 12. Equilibrium	● Unit 3 Quiz – Work, Energy, Power and Momentum
8,9	Unit 4 – Electricity and Energy Consumption	Students will gain the knowledge of electrical fundamentals to enable them to design, manipulate, and control electricity to perform tasks	STEM-FET-6.1 STEM-FET-6.2 STEM-FET-6.4 STEM-FET-7.2 STEM-FET-8.1	● Electric Current and Ohm's Law ● Basics Circuits ○ Series Circuit ○ Parallel Circuit ○ Direct & Alternating Current	● STEM Activity – PHET Simulation Model – Building DC Electrical Circuits https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc-virtual-lab	1. Voltage 2. Volts 3. Current 4. Amperes 5. Resistance 6. Ohms 7. Direct Current 8. Alternating Current 9. Insulator 10. Conductor 11. Ammeter 12. Voltmeter 13. Multi-meter	● Building DC Electrical Circuits using Circuit Boards ○ Series Circuit ○ Parallel Circuit ● Units 3/4 Test – Work, Energy, Power, Momentum, and Ohm's Law
10	Unit 5 –Safety in the Workplace	Students will demonstrate and follow safety, health, and environmental	STEM-FET-3.9 STEM-FET-3.10 STEM-FET-4.1 STEM-FET-4.2 STEM-FET-4.3	● General Safety in the Workplace ● Tool Safety (Using, Maintaining, and Storing) ● Hearing Conservation	● STEM Activity - First Aid Scavenger Hunt	1. Accident 2. Eye Protection 3. Power Tools 4. Drill Press	● Unit 5 Test – Safety in the Workplace

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		standards related to the Science, Technology, Engineering, and Math (STEM) workplaces.	STEM-FET-4.4 STEM-FET-4.5 STEM-FET-5.1 STEM-FET-5.2 STEM-FET-5.3 STEM-FET-5.4 STEM-FET-5.4 STEM-FET-5.5 STEM-FET-6.1 STEM-FET-8.5	• Hazardous Communication (HAZCOM) • Material Safety Data Sheets (MSDS) & OSHA	• STEM Activity – Safety Slogan Posters	5. Table Saw 6. Circular Saw 7. Band Saw 8. Sander 9. Decibel (dB) 10. Length of Exposure 11. Auditory Nerve 12. Cochlea 13. Stereocilia 14. Noise Reduction Rating (NRR) 15. American National Standards Institute (ANSI) 16. Flammable 17. Caustic 18. Toxic 19. Density 20. Chemical Flash Point 21. Boiling Point 22. Permissible Exposure Limit 23. Threshold Limit Value	

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						24. Short Term Exposure Limit 25. Lethal Concentration50 (LC50)	
11	Unit 6 – Universal Systems Model & Optimization	Students will learn how the systems theory demonstrates how things work and suggests that both natural and manmade systems have interrelated parts that work together to produce a desired output	STEM-FET-3.2 STEM-FET-6.1 STEM-FET-6.5 STEM-FET-7.4 STEM-FET-7.6 STEM-FET-7.9 STEM-FET-8.1 STEM-FET-8.5	● Universal Systems Model ○ Input, Process, Output Feedback ○ Simple vs Complex Systems ● Process Optimization ● Introduction to Simple Machines ○ Inclined Plane, Lever, Screw, Pulley, Wedge, Wheel & Axle	● STEM Systems Model Activity ○ Make Glitter Slime ○ Make Scented Playdough	1. Input 2. Process 3. Output 4. Feedback Loop 5. Optimization 6. Globalization 7. Simple Systems 8. Complex Systems 9. Environmental Systems 10. Biological Systems	● Systems Model Project and Presentation ● Unit 6 Test – Universal Systems Model & Simple Machines
12,13	Unit 7 – Software & Coding	Students will learn about technological advances in software design that has impacted society and use appropriate technology to collect, record, manipulate, analyze, and report data.	STEM-FET-7.1 STEM-FET-7.2 STEM-FET-7.3 STEM-FET-7.4 STEM-FET-7.5 STEM-FET-7.6 STEM-FET-7.7 STEM-FET-7.8 STEM-FET-7.9 STEM-FET-8.1	● What is Software Engineering? ● Working in EXCEL ○ Calculating Average ○ Calculating Simple & Compound Interest ○ Creating an Electronic Checkbook ● SpheroBots ○ Drawing with Spheros ○ Block Coding with Spheros ● CodeCombat - Game Coding	● STEM Activity – Using SpheroBots to Complete Obstacle Course	1. Software 2. Software Engineer 3. Programmer 4. Spreadsheet 5. Workbook 6. Tool Bar 7. Active Cell 8. Menu Bar 9. Formula Bar 10. Title Bar 11. Column Heading 12. Rows Heading	Unit 7 Test – Microsoft EXCEL Unit 7 Test – Software Engineering & Coding

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						13. Name Box 14. Block Coding 15. Java Code	
14,15	Unit 8 – Engineering Drawing	Students will learn how to apply mathematical methods in sketching three dimensions objects form a two-dimension sketch.	STEM-FET-6.1 STEM-FET-8.1 STEM-FET-8.2 STEM-FET-8.3 STEM-FET-8.4 STEM-FET-8.5	● Multiview Sketching ● Orthographic Projection ● Isometric Projection & Sketching ● Coded Plans ● Angled Projections	STEM Activity – Isometric Sketching using Coded Plans	1. Height 2. Width 3. Depth 4. Multiview Sketching 5. Isometric Projection 6. Orthographic Projection 7. Dot Graph 8. X-Y-Z Axis 9. Coded Plans 10. Projection Plane 11. Projection Lines 12. Visible Edges 13. Visible lines 14. Hidden Lines 15. Six Principle Views 16. Glass Box Approach 17. Third Angled Projection 18. First Angled Projection 19. Visible lines 20. Hidden Lines 21.	● Newspaper Chair Project ● Unit 8 – Engineering Drawing

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16	Unit 9 - Industrial Engineering & Chemical Engineering		STEM-FET-3.5 STEM-FET-6.1 STEM-FET-7.2 STEM-FET-7.3 STEM-FET-7.5 STEM-FET-7.7 STEM-FET-7.8 STEM-FET-7.9 STEM-FET-8.1	● Introduction to Industrial Engineering ○ Time and Motion Study (EXCEL) ● Introduction to Chemical Engineering ○ Heat Transfer in our Daily Lives	STEM Activity – Time and Motion Stations STEM Activity – Heat Transfer Cooking Stations	1. Time and Motion Study 2. Correct Time 3. Normal Time 4. Mean 5. Standard Deviation 6. Convection 7. Conduction 8. Radiation	● Time and Motion Study Statistical Analysis ● Unit 9 Test – Industrial & Chemical Engineering
17,18	Unit 10 – Employability Skills	Students will develop leadership, interpersonal, and problem-solving skills needed in building a successful career.	STEM-FET-1.1 STEM-FET-1.2 STEM-FET-1.3 STEM-FET-1.4 STEM-FET-1.6 STEM-FET-1.7 STEM-FET-3.10 STEM-FET-9.1	● Succeeding in the Classroom ○ Study Skills ○ Time Management ● What Do Employers Expect? ○ Professionalism ○ Good Communication (Written & Verbal) ○ Productivity ○ Punctuality ○ Networking ● Resume Writing Skills ○ The Basics ○ Highlighting your skills		1. Ability 2. Attitude 3. Effort 4. Goal Setting 5. Study Time 6. Verbal 7. Nonverbal 8. Time Management 9. Teamwork 10. Networking 11. Sarcasm 12. Soft Skills	● Rough Draft of Resume ○ Education ○ Work Experience ○ Extracurricular Activities & Honors ○ References