DEPARTMENT: TECHNOLOGY EDUCATION	COURSE TITLE: ENGINEERING & TECHNOLOGY I COURSE NUMBER: 536
GRADE(S): 9-12	PRE-REQUISITES (IF ANY): NONE

UNIT	LENGTH	CONTENT	SKILLS	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
Introduction	3 days	• A working definition of "technology" and "engineering" • The role of engineering and managing the process of building. • The Universal Systems Model of organizing technological problems • The Technology Problems Solving Method and the Scientific Method	Students will • Define the terms "technology" and "engineering" and identify their role of each in history and the present in the context of small and large construction projects and manufacturing • Apply the Universal Systems Model and Technology Problem Solving Method to problems of every day life as well as new technological problems	• Class participation in discussions and the development of the working definitions • Verbal demonstration of the ability to analyze and verbalize where significant rolls for engineers show up in the building big tape and similar scenarios provided by the teacher • Explain orally or in writing the application of the Problem Solving Method and Universal Systems Models to problems in a variety of situations	STE-4, 9/10, 1.1 STE-4, 6-8, 1.6
Safety	2 days formally and on-going through-out the course	• The evacuation procedures and the placement and use of safety equipment (exhaust fans, emergency shut-offs, fire extinguishers, eye wash units and safety glass cabinets) • The selection and use personal safety devices (safety glasses, ear protection, lab coats, welding shields, leather and plastic gloves) when in the laboratory environment • The Material Safety Data Sheet (MSDS) • Danger zones or areas for machine operators and non-operators for the: band saw, drill press, machine lathe, power hack saw, circular saw, spot, arc and ascetlyn welders and grinder	Students will: • Demonstrate the evacuation procedure for this lab and be able to identify where safety devices and equipment are kept and how to use them • Follow the safety guidelines without reminders when in a working lab environment • Identify the purpose of a Material Safety Data Sheet and end give a general overview of the types of information one could find on this document	• Written quiz on procedures and safety devices • Observation of the adherence to guidelines covered throughout the entire course • Ability to explain the role and primary information one can obtain from an MSDS	STE-4, 9/10, 7.2
Balsa Wood Bridge Unit	4 weeks	• The planning, design, construction and stress testing of a balsa wood truss bridge • The terminology and principles behind the engineering bridge building	Students will: • Compare, contrast and identify the forces that act upon a building or a bridge of different designs	• Written quizzes and worksheets on the engineering of bridge building	STE-4, 9/10, 2.1 STE-4, 9/10, 1.2, 1.3, 1.4, 1.5

		• The characteristics major types of bridges (arch, truss and suspension) and structures	• Design and generate plans for a truss bridge that applies an understanding of the forces of compression, tension, shear, torsion to maximize the load that the bridge can carry • Construct a bridge using appropriate construction techniques and tools to maximize the load that the bridge can carry • Test and then from the collected data calculate the efficiency rating of the bridge they constructed	• Sketches and plans (orthographic projection or three view drawings and isometric • Oral presentation on the bridge design covering: the application of engineering principles to the design chosen and an analysis of the bridge for anticipated failure in relation to construction technique problems and design flaws • Testing and calculation of the bridge efficiency. Efficiency = Critical Load / Wt. Of Structure • Cooperation with partner during activity • On task time during activity	STE-4, 6-8, 5.1-5.4 STE-4, 9/10, 7.4 M- 10.G5, 10.G.10
Robotic Arm Unit	5 Weeks	• Robotic Arms (design construction, and testing) • The terminology, uses and principles of robots used in industry and space. • The force and throw of a hydraulic system where syringes of different sizes are used • Basic electrical theory, the conservation of energy law and the different types of switches, circuits, series and parallel circuits • The soldering of electrical components. • The safe use of materials, tools and machines for the construction of this device (assorted hand tools, band saw, drill press, circular saw, hot glue gun, electric drill, engine lathe and spot welder) • The properties of materials so they can appropriately select the correct material for a product	Students will: • learn sketching, orthographic projection and isometric drawing by constructing preliminary and final plans for their robotic device • Review the law of Conservation of energy and be able to explain how it applies to mechanisms and systems in the Technology Education lab • Learn how to calculate the force and throw of the drive and driven cylinders in hydraulic system • Identify the names of components and the basic theory of electricity • Calculate for the missing element in Ohms Law • Apply principles of mechanical advantage (gear ratio & leverage), balance, distribution of force,	• Written quizzes and worksheets on electrical theory and Ohms Law. • *Written quizzes and worksheets on the calculation of pressure in a hydraulic system and the calculation of the area and volume of cylinders. • Sketches and plans (orthographic projection or three view drawings and isometric drawings (preliminary and final). • Oral presentation on the bridge design covering: the application of engineering principles to the design chosen and an analysis of the bridge for anticipated failure in relation to construction technique problems and design flaws. • Soldering samples and final robotic device. • Appropriate use of materials	STE-4, 9/10, 1.1, 1.2, 1.3, 1.4, 1.5 STE-3, 9/10, 2.1, 2.2, 2.3 M- 10N4, 10P8, 10G10, 10M1-4 STE-4, 9/10, 5.2, 5.3, 5.3, 5.4, 7.2 STE-3, 9/10, 5.4, 5.5 STE-4, 6-8, 1.4, 2.1, 2.2

			torsion, tension and friction to the construction of the robotic device • Practice soldering electrical wire to connectors and components and complete soldering as needed for the required circuit in their robotic unit • Safely organize and operate tools and equipment during the construction of the robotic device • Select and use materials and components for robotic unit considering the density, strength, weight, flexibility, conductivity, ability to be joined/connected to other pieces	for the function of the structural element. • Demonstration of the working robotic device through 3 cycles of picking up and dropping of the 35 mm film cartridge. • On task time during the design and construction of the device. • Cooperation with partner during the design and construction of the device. • Demonstrated safe and proper use and care of tools, equipment and supplies during the construction of the device.	
Technology Contributor Research Paper	4 class periods over 2 weeks	• The contributions of persons of different races who have made significant contributions to technology	Students will: • Reinforce research skills by using a variety of materials (books, articles and on line resources) to write the two page Technology Contributor paper • Reinforce organization and writing skills in the development of the paper	• Research for the paper • Two-page paper on a person and his/her contribution using a minimum of two references. Coverage of the content • Clarity and organization of presentation • Writing mechanics	• ITRS- 5-8 1.7, 1.27 • ITRS- 9-12- 2.4, 2.5 • ELA. 24.5