



Advanced Mathematics for Engineering & Science – A Fourth Year High School Mathematics Course (Curriculum Exchange)

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What is it?

Advanced Math for Engineering and Science (AMES) is a 12th grade math course covering a wide range of topics, as shown in Figure 1, that prepare students for further study in STEM fields. The overarching theme of the course is to provide a context for the content while driving toward the fundamental mathematics concepts used on a daily basis by engineers and scientists.

How is it structured?

Each unit in AMES begins with an activity that drives to the fundamentals that are highlighted in that unit's lessons. Throughout the lessons, the students engage in tasks that require researching mathematics history, comparing and contrasting parallel ideas, and communicating mathematics through formal written responses while learning, practicing, and applying the mathematics concepts covered. Concluding each unit is a cumulative project that requires the students to apply what they have learned throughout the unit.

Tell me more about the activities!

An inexhaustive list of activities in the curriculum is listed in Table 1. The table indicates if the project is an introductory, middle, or closing project; to which unit the project corresponds; and a brief description of the project. Figure 2 shows how the engineering design process (EDP) is used in the curriculum to frame a project where students create and test their own devices to measure radians as accurately as possible.

Figure 1: Topics Covered in AMES

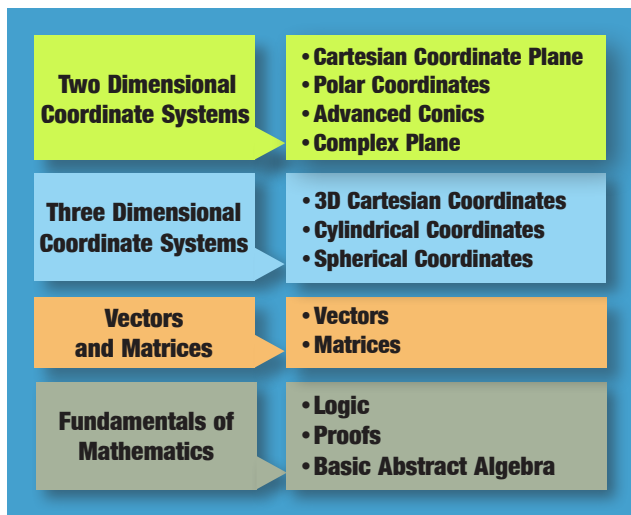


Figure 2: EDP Framing a Radian Project

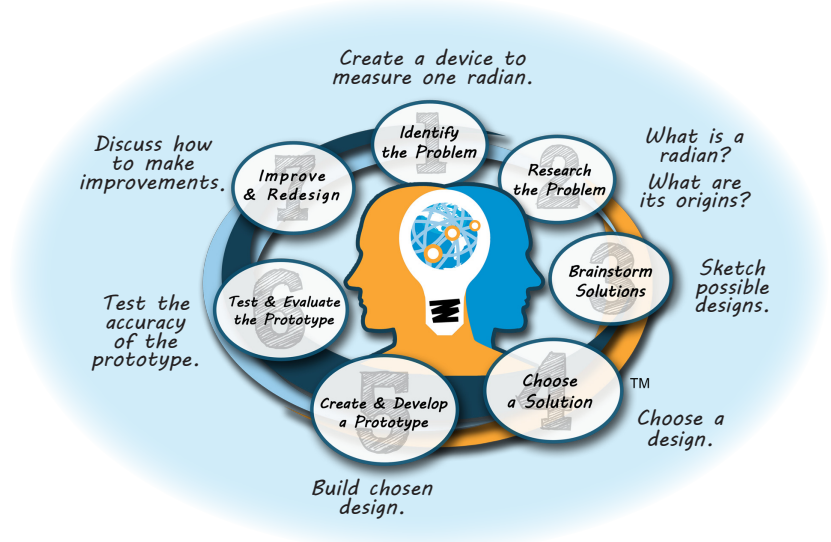


Table 1: Sample List of Projects

Type of Project	Unit	Brief Description
Introduction	Cartesian Coordinates	Locating objects without a system; focuses on specificity
Introduction	Vectors	Creating, measuring, and operating on vectors
Middle	Cartesian Coordinates	Researching Pythagoras; presenting a Pythagorean Theorem proof
Middle	Polar Coordinates	Creating a device that measures one radian
Middle	Polar Coordinates	Creating a system of angle measurement
Closing	Cartesian Coordinates	Designing and planning the layout of a city
Closing	Matrices	Encrypting and decrypting messages with matrices