

NEW MEXICO











### Our Mission

The program's mission is to promote interest in STEM education at all levels of education through robotic challenge program, and robotic





### Meet the Team





### **Not Yet Pictured**

Aaron Aguilar Xander Wietharn

Mason Kasprowicz

Back: Dr. O'Malley, Thomas Pierson, Sarah Crotzer, Jett Emms, Jared Cannon Front: Destiny Crawford, Logan Bujewski, Will Lucker, Eleanor Rightly, Noah Spivey, Raechelle Sandoval, Eric Fielenbach, Zoey Mancuso de Lopez



### **NMT Mechanical Eng Outreach Schools**

West Las Vegas MS 1) 2) West Las Vegas HS 3) Espanola Valley HS 4) Middle College HS (Gallup) 5) Anton Chico MS 6) Bernalillo MS 7) Nex Gen Academy 8) Miyamura HS 9) Thoreau HS 10) Alamogordo HS 11) Cobre HS 12) Tohatchi HS 13) Navajo Prep Academy HS 14) Deming Intermediate School 15) Parkview Elementary 16) Ruidoso MS 17) Carlsbad HS 18) **Organ Mountain HS** 19) South Valley Academy HS 20) John Adams MS 21) Mora HS 22) Taos HS 23) Ernie Pyle MS 24) Roswell HS 25) Lynn MS 26) Digital Arts and Technology Academy (DATA) 27) V. Sue Cleveland HS 28) HS in Gallup-McKinley 29) Monte Del Sol 30) Snell MS



# Program Demographics 2022-23 year

### Robotics Classrooms partnered with in conjunction with NM-MESA Program - 740 students

- 66% Title 1 School Participants:
- Ethnicity
  - Hispanic (Spanish Culture of Origin) 52%
  - Anglo (not Hispanic Origin) 11%
  - Black (not Hispanic Origin) 1%
  - Asian 2%
  - American Indian/Alaskan Origin 15%
  - Identify as two or more ethnic backgrounds 4%
  - Undeclared 15%
- Gender
  - Female 49%
  - Male 47%
  - Other 4%
- Rural 60% Urban 40%

### Robotics Classrooms Direct Partnerships - 150 students

• Rural 30% - Urban 70%

### STUDENT DEMOGRAPHICS Middle School Exploration Day(s) - 142 Students

- 100% Title 1 School Participants
- Ethnicity
  - Hispanic (Spanish Culture of Origin) 40%
  - Anglo (not Hispanic Origin) 10%
  - Black (not Hispanic Origin) 1%
  - Asian 1%
  - American Indian/Alaskan Origin 45%
  - Identified as two or more ethnic backgrounds: 4%
  - Undeclared 0%
- Gender
  - Female 47%
  - Male 49%
  - Undeclared 4%
- Rural 100% Urban 0%



# Program Breakdown Starting Fall 2023

- Introductory Arduino and Coding Program
- NMTech Miner Mayhem
  Competition
  - MESA Combat Robotics
  - 150g Combat Robotics
  - 3lb Combat Robotics
- NMTech Space Mining Rover Challenge







# Introductory Arduino and Coding Program Overview

- This program is geared towards either elementary students or groups brand new to coding
- Students are introduced to basic programming and circuitry
- The following supplies are provided:
  - Arduino/Elegoo Starter kit
- Students must have access to a laptop in order to participate
- It is expected that students work in pairs or small groups





# Arduino Online Editor

- The open source software Arduino is used for all projects
- The application can either be downloaded from the internet or accessed through a web editor
  - If the Arduino editor is used, some schools need IT dept to download an extra driver to allow the students to properly upload code to the microcontrollers
  - This method has worked with multiple APS schools



#### 90 B B B

Nai	noRCBot_WithReverseCommented_2.0		
61	digitalWrite(in4, LOW);		
62			
63	//************************************		
64	if (power > 10)		
65			
66	<pre>if (angle &lt; -20) //******RIGHT*******</pre>		
67	(		
68	<pre>8 motorl=power+(angle*power)/150;</pre>		
69	motor2=power;		
70			
71	if (motorl < 0) //****SHARP****		
72	1		
73	<pre>motorlsig = abs(motorl);</pre>		
74	<pre>digitalWrite(inl, LOW);</pre>		
75	digitalWrite(in2, HIGH);		
76	digitalWrite(in3, HIGH);		
77	digitalWrite(in4, LOW);		
78	<pre>analogWrite(enA, motorlsig);</pre>		
79	<pre>analogWrite(enB, motor2);</pre>		
80	}		
81	else //****GRADUAL*****		
82	(		
83	digitalWrite(inl, HIGH);		
84	<pre>4 digitalWrite(in2, LOW);</pre>		
85	<pre>5 digitalWrite(in3, HIGH);</pre>		
86	<pre>6 digitalWrite(in4, LOW);</pre>		
87	7 analogWrite(enA, motorl);		
88	<pre>8 analogWrite(enB, motor2);</pre>		
89	1		
90	1 A		
91	//*************************************		
92			
93	else if (angle > 20) //*****LEFT*****		
0.4	· · · · · · · · · · · · · · · · · · ·		



### Introductory Lesson Details

### Lessons consist of 3 parts:

Building a circuit	This is typically done with an outreach representative walking through each step and building alongside students. However, detailed instructions can be provided to complete these steps.
Writing the code	
Tinkering time	This is a chance for students to make changes to their code and explore their newly developed skills. Guiding questions can be provided to facilitate this time.

Lessons can be very flexible, varying in length, instruction, and difficulty. They can be unique to meet the needs of various groups.



## Introduction to Arduino

Workshop 1: Single LED Circuit

Workshop 2: 5 LED Circuit

Workshop 3: Fading LED Circuit

Workshop 4: Multiple Fading LED Circuit

Workshop 5: Introduction to Binary

Workshop 6: Sound Meter





### MESA Combat Robotics Overview

- Designed for Middle School Students and Afterschool Programs
- Students will build, wire, and code an Arduino-based Remote-Controlled robot
- Employs a combination of instruction following and some independent work with creative thinking
- Simplified outcome and platform to NMT Course MENG 110 (Intro to Mechanical Engineering)
- Workshop-Based Curriculum
  - Invitation to participate NMT's Miner Mayhem combat robotics tournament upon completion





# **MESA Combat Robotics**

- Construction Details:
  - Programming is based on Arduino
  - Constructed using common educational robot parts
    - The robot is ordered as a kit with all required components
  - Does not require special tools or skills
    - No soldering, only plug in connectors
  - Safer alternative to combat robots
    - Employs household batteries
    - No "dangerous" activate weapon systems
  - Frame can be made from foam board or 3D-Printed
    - Students have option to customize design
    - No CAD modeling experience is required, but students are encouraged to learn and submit any designs they have for review





### **MESA** Combat Robotics

### Lesson Consists of 4 Main Sessions

Assembly	Students will follow instruction manual guiding them through all of the wiring and component placement. Students can chose to modify the frame at this time or work on a new design.
Arduino Programming	After being introduced to the Arduino language, the students will be taught how the robot functions electronically. They will then be given the opportunity to explore the given code and understand.
Reverse Code	This is a chance for students to make changes to their code and explore their newly developed skills. Guiding questions can be provided to facilitate this time.
Weapon Basics	The final workshop informs students on how to add and code a servo motor to the robot for use as a weapon. It also teaches students how to connect the weapon to the remaining button on the transmitter.

Teachers are provided with all necessary documents, and NMT mentors will be available

## What's new with MESA Bots in Fall 2023

- Motivation: We see some schools do a very good job of customizing the bots and others hold very close to the instructions.
- Improvement: NMT students have designed 3 new variations of the program
  - Wedge bots (original)
  - Spinning weapon bots
  - Flipping bots
  - Hammer weapon bots
- Desired Outcome: Encourage more creativity





## 150g Combat Robotics Overview

- Designed for high-school students
- Provides participants with a hobbyist-level, competition-grade experience
- Students will construct a functional, but overweight robot and will then be tasked to reduce weight through creative means
- Requires more advanced skills and greater care for safety
- Develops soldering and design skills rather than coding skills



NMT 150g Base Robot



# 150g Combat Robotics

- Construction Details:
  - Electronics based on NMT club bots
  - Students must redesign provided frame (Reduce weight)
  - No coding experience is needed for this program
  - More advanced technical skills will be required or taught:
    - Proficiency in and access to a suitable CAD program
    - Experience with soldering
  - An variety of tools will also be required
  - Invitation to participate NMT's Miner Mayhem combat robotics tournament upon completion



150g Robot - Big Shot



# NMTech Space Mining Rover Challenge 2023

- Inspired and Designed around NASA Lunabotics
  - Targeted to support HS programs
- Program Objectives
  - Advanced coding
  - Component design and selection
  - System integration
- Mission: Complete a Design, Build, Test competition. Build your own rover that navigates a simulated planetary surface and extracts target material.



DAVIID - NMT NASA Lunabotics Team 2022

# NMT Space Mining Rover Challenge High school level program







# NMTech Space Mining Rover Challenge 2023 Requirements

- Program will provide basic instruction and components to fabricate a rover that can drive.
- Students will be tasked with evaluating the physics of the system and determining how to make their own design that optimizes:
  - Ground clearance
  - Stability
  - Maneuverability
- Teams will be challenged to add:
  - Feedback sensors
  - Sample extraction device
  - Some level of autonomy





# AFRL Career Stream Program (Summer 23)

- This 6-week paid apprenticeship program pairs high school student apprentices with college student mentors to form Project Teams.
- Each Project Team is affiliated with a college Campus Site and is led by two STEM Project Mentors.
- Each Campus Site also has a STEM Pathways Mentor who meets with the Project Teams to discuss campus resources and opportunities.
- Apprentices earn 4 stipends totaling up to \$2,750
- Begins on 5 June 2023 and ends on 14 July 2023
- Approximately 30 hrs per week Mon thru Fri

Flyer and Application details - https://afrlnm.com/stem/stem-opportunities/



## NMT Robotic Combat STEM Outreach

- Our program offers an introduction to STEM related topics and can be adjusted for all age groups and classes
- We work to introduce students to STEM experiences to help spark their interests
- We strive to offer this program to schools and districts that do not have a
  STEM related curriculum

To learn more about our program please visit our website or contact Curtis O'Malley at **curtis.omalley@nmt.edu** 







### Let the 23-24 Mayhem Begin!







### New 2023 – Mobile Demonstration/Event Trailer





### Sponsorship Levels

- Sponsor Under \$10,000
  - Logo listed on website, listed on sponsor banner at tournament, and at least one social media post
- Local Sponsor- \$10-15,000
  - Support for 1 classroom
  - Same as Sponsor, plus logo added to event shirts
- Regional Sponsor \$20-45,000
  - Support for several classrooms
  - Same as Local Sponsor, plus logo featured in a Youtube highlights video of the schools from their region (ie. South-East NM, Los Alamos area, etc.)



### Sponsorship Levels - continued

### • State Sponsor - \$46-75,000

- Supports many classrooms across the state
- Same as Regional Sponsor, plus individual banner at tournament

### • Tournament Title Sponsor - \$76,000-100,000

- Same as State Sponsor
- Name added to tournament logo (2 opportunities)
  - NMT Miner Mayhem Presented by <your name>
  - NMT Space Mining Challenge Presented by <your name>
- Program Title Sponsor \$200,000
  - Prominent Listing in Program title
    - NMT Robotics Outreach Program Presented by <your name>
  - Prominent Logo placement on Demonstration/Event Trailer