



NEW MEXICO MATHEMATICS, ENGINEERING, SCIENCE ACHIEVEMENT, INC.

MESA USA



ARDUINO BASED SOLUTIONS FOR HUMANS- ENERGY AS A GRAND CHALLENGE

**MARCH 24, 2020
ALBUQUERQUE, NEW MEXICO
AIR FORCE RESEARCH LABORATORY-
LA LUZ ACADEMY**

**NEW MEXICO-
OFFICIAL LOGISTICS ADDENDUM**

MESA USA GENERAL INFORMATION

For 2020, the MESA USA Event will be held the day prior to the MESA Day Competition as part of New Mexico MESA's Competition Series. For full rules on either MESA Day or MESA USA please consult the required handbooks. This addendum serves as the official New Mexico Specific Logistics Guide that is to be used in tandem with the National MESA USA Handbook. All rules and guidelines detailed in the National Handbook are to be followed for the competition. This document will only contain information not included in the National Handbook.

COMPETITION OVERVIEW: The 2019-2020 MESA USA National Engineering Design Competition Performance General Specifications for the *Arduino-based Solutions for Humans* challenge are as follows:

The competition asks students to use a Human-Centered Design approach to develop an Arduino based solution to a client's need. The competition will consist of the following components:

1. **Technical Presentation & Interview**- The objective is to provide an overview of the prototype functionality including a technical explanation of the mechanical operations, software operations, and integration of the two. Students will prepare a short presentation and demonstration of the functionality of the prototype followed by a question and answer session with judges.
2. **Poster & Symposium** - The objective is to provide an overview of their project, highlighting key points of the design process including relevant data, presenting the resulting prototype, and share conclusions and recommendations for further development. Students will prepare a printed academic poster, which will be used during a public poster symposium to provide an easily understood overview of the project and the prototype.
3. **Project Report** - The objective is to provide an overview of the design process and demonstrate team's effective use of the Engineering Design Process. Students will write a 5-10 page report that contains their problem statement, summary of the design process, and description of resulting prototype supported by pictures, charts, tables, and/or graphs. The report should be a journey through the design process and demonstrate key points of the process and why design choices were made. The report must have an appendix.
4. **Prototype Pitch** - The objective is to convince investors or management that the design meets the client's needs, is superior to other options available, and has business value as a product. Students will prepare a creative, engaging presentation to pitch their prototype to an audience, including a group of judges. The presentation should define the problem; provide a detailed description of their client and their needs; discuss current solutions to the problem and their weaknesses; provide a demonstration of their prototype highlighting its advantages, and demonstrate the business value of the product including a market analysis and marketing plan.

The 2019-2020 Theme for New Mexico MESA is Energy. All projects MUST relate to Energy.

ALL TEAMS: Each team will be composed of 3-4 students. *Because some items are due prior to competition, teams must be determined by the initial submittal deadline.*

- Final team members must be declared when submitting the final registration materials and required items. No changes, alternates, or additions are allowed after this point.
 - Any team that requires any particular accommodations must make a request to NM MESA when submitting the final registration materials.
- The 1st Place overall winning teams in both the middle school and high school level will be chosen to represent New Mexico in the 2019 MESA USA National Engineering Design Competition in June, 2020 in Arizona. Only members that attend and participate in the State Competition will be allowed to participate in the National Competition. No changes or additions are allowed.

It is suggested to start with a team of 4 in the event a member cannot participate in the State and/or National Competition.

Each team is to declare and keep a designated team name that will be used as a unique identifier throughout all phases of the MESA USA process. All submitted team documents and materials **MUST** be saved and submitted with the chosen unique team name.

Team names MUST be declared as follows: (School) (Level) – (Team Unique Name). *Example: Mesaville High School – Team Potter or Mesaville High School Team Potter*

ELIGIBILITY: Advisors must enter all profiles (A-2's) and submit all A-1's to their Regional Coordinator's Office by 5pm, February 28, 2020. Only the students listed on the roster (have their A-2 submitted and have their A-1's submitted) will be eligible to participate. **NO EXCEPTIONS!**

Of Special Note to Middle/Junior High Schools serving 9th grade students – Each middle/junior high school that includes a 9th grade class is allowed to have an event team with a maximum of 50% 9th grade students. These teams will compete in the Middle School division **only**. **No** 100% 9th grade teams will be allowed in middle school competition.

ATTENDANCE AND QUALIFICATION: All schools will be allowed to bring up to (3) teams to MESA USA if they have over 20 profiles. **This is different from previous years' allotment.**

PLAGIARISM AND ADVISOR POLICY:

Academic honesty and personal integrity are essential to ensure future success as college students and STEM Professionals. As such, NM MESA expects that the work will be solely the work of the students. If the work or ideas of another are used to further students' work then proper credit must be given to the owner. Failure to do so will result in an act of Plagiarism. If it is determined that a student committed plagiarism, they will be disqualified from the competition and they will be ineligible to receive any awards. They may also risk further sanctions from MESA USA and/or their MESA State. All work is to be new and original for the current project year.

STATEWIDE OFFICE MIMS CREDIT:

Students that submit items at the initial qualification deadline will receive an "Other Competition" Participation Credit in MIMS. Students that actually compete in the MESA USA Event will receive a MESA USA Participation Credit in MIMS as it is the qualifying event for our National MESA USA Competition.

- Additionally, students that complete and submit interest form and early phase project form as directed will receive a workshop credit for each submittal. Forms will be available of the MESA Day Website after October 1, 2019.

Advisors (or non-competitors) are **NOT** allowed in any competition area unless instructed. All adjustments to project **MUST** be conducted by the student competitors and once competitions begin, students may not have contact with non-competitors. Also, any complaints and/or appeals need to be addressed by the **STUDENTS** to the Event Coordinator **DURING** the event. Individuals may be allowed to enter areas to take pictures, but that is at the discretion of the Event Coordinator and no contact can be made with competing students.

AWARDS: (Middle and High School)

- Trophies will be awarded to the top 3 overall teams (1st-3th Place).
- Awards will be presented to individual team members placing 1st – 3rd Place.
- Awards will be presented to the top team in each individual event (1st Place).
- 1st Place Overall Teams will attend MESA USA Nationals.
- People's Choice Award will be given to the chosen project.

- Additional awards may be provided.

DISQUALIFICATION: Individual event teams can be disqualified for the following:

- Any team member not having a Student Profile (A2) in database or A1 on record by deadline
- Lead judge disqualifies an event team for not following event guidelines
- Unauthorized use of cell phones during event(s)
- An event team is found to have violated event guidelines after competition has concluded
- General inappropriate behavior at any time during the competition
- If after competition is concluded, it is found that any team violated rules or requirements for any event, they may be disqualified from competition and will forfeit any qualification or placement spots they may have earned.

MESA USA REGISTRATION: This is required for any team wanting to attend MESA USA. All qualification registration and submittal of materials will be done via the Cvent System with a direct link on the **MESA Day Event Page** on the NM MESA Website. **ALL REGISTRATION WILL NEED TO BE SUBMITTED ELECTRONICALLY BY FEBRUARY 28, 2020 AT 5pm.** Refer to the needed materials in this handbook for details, requirements, and instructions for submittal. In addition to the electronic submittal, all Regional Coordinators will verify team preparedness with team inspection(s) and interview.

Information that will need to be collected during this process is: Project Report, transportation requests, team names, and RC Inspections. ***NM MESA STAFF has the authority to cancel attendance for any team if they do not have completed projects and/or are not prepared to attend MESA USA up to the date of the event.***

IMPORTANT: The registration portal will be the same for MESA Day and MESA USA Competitions. You will only select the competition(s) you are participating in.

ADDENDUMS AND EVENT RESOURCES: There are several addendums and resources which will be useful in preparing for MESA USA. All addendums will be available on the NM MESA-MESA USA Event Website. These include:

- Any Final Logistical Information
- Templates and Inspection Lists
- Event Resources and Helpful Preparation Information
 - There will be a link to an official resource page. Each event will have an opportunity to post helpful resources.
- MESA USA Frequently Asked Questions (FAQ)
 - Will be changed throughout year as questions arise

It is the responsibility of the school program to periodically check for resources and updates. Before competition date, it is STRONGLY encouraged as the FAQ section will contain any clarifications and/or addendums to the event handbook and these will be followed at competition. The FAQ document is an official MESA USA Document and is the official addendum to this handbook.

LODGING: For each student team participating in MESA USA and living more than (30) minutes away, a lodging stipend will be provided as follows:

- Up to \$100 for (1) student room
- Up to \$100 for (1) advisor room
 - If advisor(s) are bringing more than (1) team, additional stipends will only be provided for additional advisor room(s) if the official team advisor(s) is a different person and of a different gender.
- Up to \$100 for (1) bus driver room
 - This will only be provided for schools that have an official driver

To claim the lodging stipend, teams must participate in MESA USA and the school must be participating in MESA Day the following day. Schools must submit a copy of your lodging receipt with an amended check request form (available closer to the event). Reimbursement will be made to the entity paying for the room(s): MESA Region, School, MESA Fund, Etc. Lodging is not provided for MESA Day teams, only for those participating in MESA USA.

TRANSPORTATION: NM MESA will pay for transportation to and from MESA USA in accordance with transportation guide. All programs will be required to bus pool, utilize district suburbans, or other methods of economical transportation as able. Your Regional Coordinator will be working with all attending teams to arrange transportation.

There will be strict drop off, parking, and pick up guidelines as the event is being held on Kirtland Air Force Base (KAFB). Because of this transportation NEEDS to be determined by the Registration Deadline. Final drop off and pick up instructions will be provided closer to the event. It is encouraged that there is only (1) vehicle per school.

KAFB/AFRL REGULATIONS: Because this event is being held on the KAFB campus there are some attendance regulations that need to be followed and collected at registration:

- 1.) Only the MESA USA Student Names and Official Advisor(s) will be provided for entry.
- 2.) If any additional people (students or adults) want/need to attend, all additional names must be provided for entry at registration.
- 3.) All attending adults will need to provide additional information during registration to gain entry onto KAFB. Final information will be determined based on current security guidelines, but should include legal name, birthdate, and country of birth.
- 4.) All attending adults will need to have current government identification.
- 5.) If any attending adults were not born in the United States please notify Anita Gonzales by February 7, 2020. There is a different method to obtain security clearance (and entry) that may take longer than collecting information at the registration deadline.

NOTE: Students DO NOT need to disclose any information as they will be escorted by KAFB personnel at all times on campus. They will not be asked for anything upon entry. Information will be collected in advance as to avoid any delays and to ensure a smooth entry onto campus. If there are any personal concerns on anything detailed above please contact Anita Gonzales to work through them to facilitate clearance and entry.

GENERAL NOTES: Schools arriving late to MESA Day or teams arriving late to an event will participate at the discretion of the lead judge. Extra time will not be allotted to any team arriving late. Schools are expected to participate fully and are asked not to depart until the conclusion of their assigned session. Students should be instructed to demonstrate good sportsmanship and will be held accountable for any misbehavior. Students are reminded to respect the competition areas. **DO NOT** leave your trash anywhere; use the trash containers provided. Students are required to clear their own tables and throw away their trash.

Cell Phone usage –Advisors are asked to follow and remind their students about appropriate cell phone protocol, including the misuse of 911, texting, cameras, general usage, and calculators during competition and general events. Judges will repeat this cell phone usage reminder at the beginning of each competition. Failure to comply may lead to disqualification.

TIMELINE: Below is a suggested timeline to prepare for both the MESA USA Competition.

Month	To Do
August	Regional Coordinator Contact and Training as Needed. Regional RAMS-Advisor will give a review for the year.
September	Release of the MESA USA Handbook Install any needed software and make arrangements for computer usage. Verify school procedure for buying and ordering materials. Start creation of teams and groups for projects. Start brainstorming client needs and client identification. Start Engineering Design Notebooks. Start any introductory Arduino lessons to familiarize software and hardware. Start Arduino sensor research.
October	Create Project Plan and solidify team. Continue client and project research. Conduct Arduino sensor research and hardware possibilities. Make arrangements for Regional Support event(s)-transportation, facilities, leave, etc.
November	Compile team research and identify chosen client and community need. Conduct market and competitor research. Determine what to Prototype and create materials list. Regional Rallies and/or Regional support events. Order any preliminary Arduino materials and sensors. SUBMIT MESA USA Interest Form-November 1st
December	Start building prototypes and testing Start Arduino programming. Continue to document all work in Engineering Notebook. Refine Project Plan to meet current progress and holiday break(s). Ensure computer availability and access for upcoming dates and requirements.
January	Iterate, monitor, and evaluate prototypes. Set up Regional Coordinator Review Date. Using Engineering Notebook: Start Project Report and the Academic Poster. Continue to check the NM MESA USA Page for needed information located on the NM MESA website. SUBMIT MESA USA Early Phase Project Form-January 13th
February	Continue final items for MESA USA Qualification and Project Iterations <ul style="list-style-type: none"> • Project Report • Academic Poster MESA USA Submittal Deadline-February 28, 2020 @ 5PM <ul style="list-style-type: none"> • Deadline to enter students in MIMS (A-2) and to submit A-1's to Regional Coordinator for MESA Day eligibility. • Regional Coordinator Inspections • Submit USA Items-Project Report Work with Regional Coordinator to determine transportation and attendance logistics. Finalize Team Projects
March	Arrange for Academic Poster to be Printed Continue to Finalize Projects Practice Interview Skills, Pitch, and Prototype Demonstration MESA USA Competition: March 24, 2020 MESA Day Competition: March 25, 2020 Competition Final Scoring and Awards LIVE Announcement: March 26, 2020
May-USA	Winning Teams to convene for Initial Nationals Retreat Start review and refinement of project for National Guidelines and Competition
June-USA	Winning Teams to convene for 2 nd Nationals Retreat and Draft Presentation Finalize National Competition Materials-Submit Final Project Report and Submit and needed Printed Materials. 2019 MESA USA National Engineering Design Competition @ Arizona



MESA USA COMPETITION GENERAL AGENDA

March 24, 2020

Kirtland Air Force Research Laboratory-La Luz Academy

11:30 AM	Staff Reports	<i>La Luz Academy</i>
12:00 PM	Judges Report: Lunch and Orientation	<i>TBA</i>
1:00 PM	GROUP 1: ARRIVES	<i>TBA</i>
	• Security Check In, Registration, Poster Set Up	<i>TBA</i>
2:00 PM	GROUP 1: Competitions Begin	<i>TBA</i>
	Project Pitch Middle School (8 Teams)	<i>TBA</i>
	Project Pitch High School (8 Teams)	<i>TBA</i>
	Technical Report:	<i>TBA</i>
	• High School A (4 Teams)	<i>TBA</i>
	• High School B (4 Teams)	<i>TBA</i>
	• Middle School E (4 Teams)	<i>TBA</i>
	• Middle School F (4 Teams)	<i>TBA</i>
	Academic Poster Judging	<i>TBA</i>
3:00 PM	GROUP 2: Arrives	<i>TBA</i>
	• Security Check In, Registration	<i>TBA</i>
3:30 PM	GROUP 1: Removes Academic Poster and Display	<i>TBA</i>
	GROUP 2: Set Up Academic Poster and Display	
4:00 PM	GROUP 1: Departs Event	<i>TBA</i>
	GROUP 2: Competitions Begin	
	Project Pitch Middle School (8 Teams)	<i>TBA</i>
	Project Pitch High School (8 Teams)	<i>TBA</i>
	Technical Report:	<i>TBA</i>
	• High School C (4 Teams)	<i>TBA</i>
	• High School D (4 Teams)	<i>TBA</i>
	• Middle School G (4 Teams)	<i>TBA</i>
	• Middle School H (4 Teams)	<i>TBA</i>
	Academic Poster Judging	<i>TBA</i>
5:30 PM	GROUP 2: Removes Academic Poster and Display	<i>TBA</i>
6:00 PM	GROUP 2: Departs Event	<i>TBA</i>
	Event Coordinators: Review and Submit Score Sheets	<i>TBA</i>
	Judge and Staff Debrief	<i>TBA</i>

NOTE: The length of the event is determinant on the final number of registered teams. Agenda may be altered to accommodate any change in groups if needed. Exact room locations and competition times will be provided closer to the event, but the entire event will be held within the La Laz Academy Facility.

MESA USA QUALIFICATION REGISTRATION INSTRUCTIONS

Deadline: February 28, 2020 @ 5PM

ALL INFORMATION WILL BE COLLECTED ELECTRONICALLY AT WWW.NMMESA.ORG

Form will no longer be collected in hard copy, but the following information will be needed to complete on-line registration. (1) Registration will be done per school and will collect all needed information for both MESA Day and MESA USA Competitions.

You are reminded that you are only eligible to bring the amount of teams listed below based on your program size. All attending teams must be ready for competition. Events are designed for an event team of 3-4 students.

MESA USA Competition	
20 + profiles	Max number of teams=3

Information You Will Need Per School Registration:

- Unique Email Address
- School Name, Level (HS or MS), Region
- Advisor Information (all attending, contact information)
- Transportation Information (vendor, amount, contact information, type, etc)-Will determine PO or parking arrangements.
- Good Mailing Address-In the event any information needs to be mailed to you including a parking pass.
- Leadership Council Nominee Information (Optional for MESA Day)-2 Students per Program. Be prepared to answer short questions about nominated students' skill(s) and why you are recommending them.

Information You Will Need Per MESA Day Team: ONLY IF YOU ARE PARTICIPATING

- Team Member Names (Up to 4)
- Alternate Member Names (Up to 2)
- Regional Coordinator Inspection-Working or Potential to be Working Prepared Design, General Preparedness.

Information You Will Need Per MESA USA Team:

- Team Member Names (Up to 4)
- Official Advisor Name. In the event of advancement and if a school has multiple advisors, an official advisor must be declared prior to competition.
- Regional Coordinator Inspection-Working or Potential to be Working Prototype, Submittal of Required Project Report, Sample Interview, General Preparedness.
- **Team Submittals You Will Need to Upload Per Team:**
 - Project Report:
 - MUST be submitted in Portable Document Format (.PDF) as (1) Document and no larger than 9MB in document size.

Regional Coordinator Inspection Checklist

*This form is required to qualify for MESA Day/MESA USA and will determine event participation
Inspections must be completed by February 28, 2020 at 5PM*

School: _____ [] HS [] MS Region: _____

TOTAL # Profiles: _____

Inspection Done: In Person Online (Facetime, GoTo, Etc) _____ Other _____

Date Inspection Done: _____

<i>Mark all objectives met for each team and use bottom section to indicate if team has qualified to attend MESA Day.</i>	MD 1	MD 2	MD 3	MUSA 1	MUSA 2	MUSA 3
NOTE: Each individual team has to meet qualification to attend. Projects/Models must be unique to each team. Plagiarism will not be tolerated. Teams will be disqualified from participation for copying or allowing another team to copy their work.						
MESA USA Competition: ONLY IF TEAM IS PARTICIPATING IN MESA USA						
Prototype is a working prototype or has potential for completion by event date.						
Prototype is able to demonstrated and described adequately.						
Uses Arduino programming and hardware.						
Has an input and output relay of information.						
Team has submitted a project report by the required deadline according to specifications						
Team has completed an oral interview with the Regional Coordinator-Oral interview will be a question/answer session over concepts and your project						
MESA DAY Competition (On Site):						
Team has generally prepared for the topic of “Energy as a Grand Challenge”						
Prepared Design: Event is in progress as follows and has potential for full completion						
Model AND Blueprint is designed specifically for the given family size (4 people, 2 adults and 2 children) AND meets max requirement of 1200 Square Feet						
Model AND Blueprint meet scale criteria: MS: 1/2 inch=1ft HS: 1/4 inch=1ft						
Model is not constructed from any model building kits (Models of trees, landscaping, windmills, etc. are acceptable as accessories)						
Model home or blueprint demonstrates that it is equipped with all basic home systems such as plumbing, lighting, heating/ cooling and water. (These components cannot be external from the home)						
Model demonstrates that it is “off the grid” and self-sustaining/energy efficient						
Model home shows that it is powered by at least two renewable energy sources. These sources can be external from the home						
Model is mounted on a foam board no larger than 20” x 30” x 3/16”						
Blueprint uses appropriate architecture symbols and is properly labeled						
Blueprint has a 1/2 inch margin						
Team has created a visually appealing brochure that has information asked for						
Team has prepared a 3-minute pitch						
MARK IF TEAM QUALIFIED:						

Regional Coordinator Inspection Checklist-Page 2

Team Name:	Student Team Members (Up to 4)	Student Alternates (Up to 2)
MESA Day Team 1:		
MESA Day Team 2:		
MESA Day Team 3:		
MESA USA Team 1:		NOT ALLOWED
MESA USA Team 2:		NOT ALLOWED
MESA USA Team 3:		NOT ALLOWED

All Team Members must be in MIMS with their A-1 and A-2 Submitted to be Eligible as of Registration Deadline

NOTES:

Other Things to Discuss During Inspection are: Transportation Arrangements, Meals, Lodging, Etc.

Regional Coordinator Signature/Date: _____

Advisor Signature/Date: _____

If Inspection is done Virtual, Advisor must complete form with signature then submit to RC for Approval and Submittal