ENGINEERING LAB BOOK

LEVEL: Middle and High School (all grades)

SCOPE: Required for all MESA Day project competitions
(except: MESA Shark Tank, National Competition, Pilot Competitions)

OVERVIEW: The purpose of the Engineering Lab Book is for students to more closely follow the practices of an engineer in the completion of their MESA Day projects. The Engineering Lab Book will encourage students to take a purposeful and sustained approached to building their devices. MESA projects are not designed to be completed in a single class period or day, but to be the result of thoughtful research, planning, analysis and evaluation. The lab book should provide a daily and constant written record of the thought and insight that a team is putting into their project, from initial ideas to the final completed project.

MATERIALS: There are three format options for lab book submittals:

Electronic Lab Book
Teams use an electronic portal/application such as Google Docs to keep and maintain lab book. Access to such a lab book is then given to MESA Day staff and judges OR lab book is submitted electronically (e.g. PDF file) for review.

Printed/Written Pages
Teams record their lab book entries by hand or typed through a program like MS Word. Printed/handwritten loose leaf pages are then submitted (pages must all be well organized and clipped/stapled together).

Standard Lab Book
Teams use a standard notebook (composition books, spiral notebooks, subject notebooks, etc.). Lab book page size must be equivalent or greater than that of a composition book page (approx. 9.75" length x 7.5" width). Pocket sized books, post it notes, flashcards, etc. cannot not be used. .

Please check with you local center director for the format required for your preliminary event. Electronic submissions will be required at the Regional/State level.

REQUIREMENTS: Lab books are meant to clearly demonstrate and illustrate evidence of the application of the Engineering Design Process in the MESA project. One lab book per team should be submitted per competition.
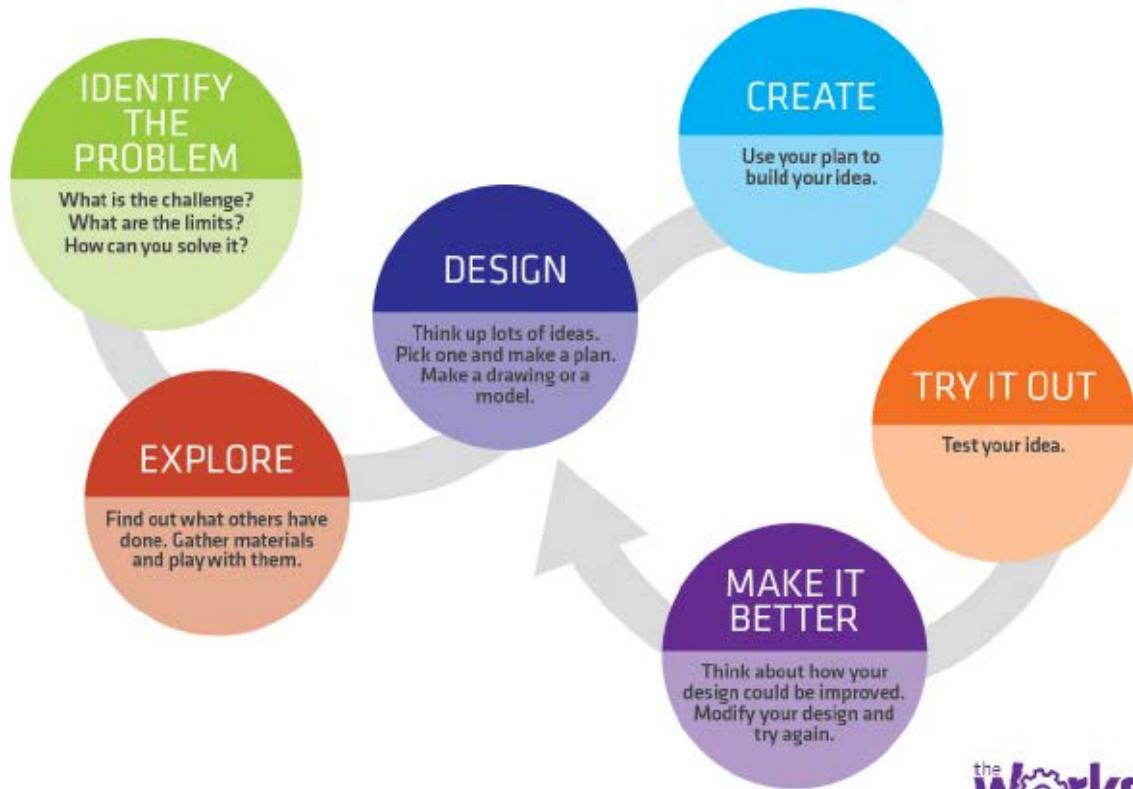
Engineering lab book must be properly labeled (names, school, center, grade level, etc.) and contain and cover the following sections, with each section tabbed/labeled:

1. **IDENTIFY THE PROBLEM** (at least 2 sentences for each question)
   State what is the challenge being worked on? What are the limits/constraints?
   How do you think you can you solve it?

2. **EXPLORE**
   Find out what others have done (research). Clearly list at least 5 sources (web pages, books, etc.). Identify (cite) and describe them.

3. **DESIGN**
   Brainstorm ideas (at least 3 ideas) and record them. Each idea should be represented by a sketch or drawing. Select one idea and create a plan (at least 5 sentences) to build a prototype from. Generate a list of materials for your prototype.

4. **CREATE**
   Using your plan, build your prototype; describe the building of prototype (at least five sentences). Include a picture of the actual project prototype.

5. **TRY IT OUT**
   Test your idea/prototype. Attempt at least 3 trials/attempts of your test. Measure the results of your test (by project performance criteria). Provide evidence of the use and application of at least 2 appropriate mathematical concepts in your tests.

6. **MAKE IT BETTER**
   Describe how you can make the project better and what modifications you will be making (at least 5 ways you can improve project). Build and prepare competition ready project. Include a picture.

SCORING: A deduction of 50% of the total project score will be assessed for a missing lab book and will make team ineligible to place. (A missing lab book is one that is not submitted and received through the required methods OR is missing at least 3 of the 7 specified criteria on the rubric.)

A deduction of 20% of the total project score will be assessed for an incomplete lab book (An incomplete lab book is one that does not meet up to 2 specified criteria). Each section must be complete (every requirement listed) to meet this requirement and not receive a deduction.

ENGINEERING DESIGN PROCESS

IDENTIFY THE PROBLEM

What is the challenge?
What are the limits?
How can you solve it?

CREATE

Use your plan to
build your idea.

DESIGN

Think up lots of ideas.
Pick one and make a plan.
Make a drawing or a
model.

TRY IT OUT

Test your idea.

EXPLORE

Find out what others have
done. Gather materials
and play with them.

MAKE IT BETTER

Think about how your
design could be improved.
Modify your design and
try again.

the **Works** museum
Engineering Fun

copyright 2007 the Works Museum

Engineers use the Design Process to create something new or make something better.

MESA DAY 2019-2020

Lab book Requirement Rubric *(specific criteria may vary by individual competition)*

Project:_____

Please use this rubric to assess lab book entries. An incomplete lab (i.e. missing 1 to 2 specified criteria) book will lead to a 20% deduction from the total project score. A missing lab book will lead to a 50% deduction (i.e. not submitted OR missing 3 or more specified criteria) from the total project score and will make team ineligible to place.

TEAM MEMBER NAMES:_____
SCHOOL:_____CENTER: _____

LEVEL (circle one): 6th   7/8th   9/10th   11/12th

Criteria		YES	NO
	Is the lab book properly labeled? *(Names, Grades, School, MESA Center)*		
1	**Identify the Problem (at least 2 sentences for each)** *State what is the challenge being worked on? What are the limits/constraints? How do you think you can you solve it?*		
2	**Explore** *Conducting research (listing and describing, with one sentence, 5 cited/referenced sources).*		
3	**Design** *Brainstorming ideas (at least 3 iterations) each represented by a sketch or drawing. Creating a plan for selected idea (at least 5 sentences). A list of materials for the prototype.*		
4	**Create** *Building a prototype. Describing the building of the prototype (at least 5 sentences). Including a final picture of the project.*		
5	**Try it Out** *Testing idea/prototype. Attempting at least 3 trials/attempts. Measuring each trial result (by specific performance criteria like distance traveled, time, etc.). Providing evidence of the use and application of at least 2 appropriate mathematical concepts in the tests.*		
6	**Make Better** *List at least five ways project can be improved. Build final project. Include picture.*		
	TOTAL		
	Lab Book Complete (mark with X)		

Is this considered an **incomplete** lab book?.. **NO   YES** (-20%)

Is this considered a **missing** lab book – missing 3 or more criteria listed?.......... **NO   YES** (-50%)