## Mechanical

Engineering

## **Mechanical Engineering**

- Design, building, maintenance of mechanical and fluid systems
- Concepts used since ancient civilization
- Increased during Industrial Revolution



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#### Education

- Mechanical engineer
  - Bachelor's degree
  - Specialization
  - Internship
- Mechanical engineering technician
  - Associate's degree
- Professional societies



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## **Principles of Mechanical Engineering**

- Force
  - Moves object
  - Required to accomplish work
- Work ( $w = f \times d$ )
  - Force applied, movement occurs
- Power (p = w/t)
  - Rate at which work is performed



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## **Mechanical Engineering in Action**

- Focuses on transmission of power
- Design systems to improve efficiency



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# Car Projects

#### **Construction Hints**

• When building a model car, there are a number of variables to consider

• Weight of the car

• Placement of the power source

• Size and type of wheels

• Friction between wheels, axles, frame

## Weight of the Car

- For most cars, you want to build the lightest possible vehicle
  - Lighter vehicles will require less force to begin moving and will experience less friction than heavier vehicles
- However, if your car is too light, it will not have enough traction

 This can cause the wheels to spin out or the car to break easily

## Size and Type of Wheels

- For most cars, larger wheels will cover more distance per rotation than smaller wheels
- Make sure your wheels have good traction so they don't slip. You can increase traction by covering the edges of the wheel with the middle of a balloon

![](_page_8_Figure_3.jpeg)

(from Doc Fizzix's Mousetrap Powered Cars & Boats)

![](_page_9_Picture_0.jpeg)

- Axle design is important to reducing friction.
  - Do the wheels rub? If so, use sand paper to smooth the axle.
- Lubrication of the axles can reduce friction but be careful not to get any on the wheels or they will slip.

#### Considerations

• More than one power source?

 $\circ$  2 batteries instead of 1

 $\circ$  2 sails instead of 1

 $\circ\,\text{More}$  rubber bands

Go straight (turning is a problem)

 Are the axles straight?
 Are the wheels on straight?

#### Challenge #1: Sail Car

Propel your car using wind from a box fan!

![](_page_11_Picture_2.jpeg)

Use any materials to design a mast and sail that propels your "sail car" forward.

 Be creative and don't give up! If it doesn't work, try something different!

#### Challenge #2: Rubber band Car

![](_page_12_Picture_1.jpeg)

#### **Challenge #3 Gravity Car**

![](_page_13_Picture_1.jpeg)

#### Challenge #4: Mousetrap Car

The spring propels the rod which is connected to rubber bands that are wound around the drive axle

![](_page_14_Picture_2.jpeg)

#### **Challenge #5: Propellor Car**

![](_page_15_Picture_1.jpeg)

#### **Challenge #6: Electric Car**

![](_page_16_Picture_1.jpeg)

#### Challenge #7: Magnetic Car

![](_page_17_Picture_1.jpeg)

#### Challenge # 8 Straw Air Car

![](_page_18_Picture_1.jpeg)

## Challenge # 9 CO<sub>2</sub>

![](_page_19_Picture_1.jpeg)

#### Challenge #10: Gondola

![](_page_20_Picture_1.jpeg)

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## **Rubrics**

- 100 5 seconds
- 98 6 seconds
- 96 7 seconds
- 94 8 seconds
- 92 9 seconds
- 90 10 seconds

- 88 11 seconds
- 86 12 seconds
- 84 13 seconds
- 82 14 seconds
- 80 15 seconds

- 78 16 seconds
- 76 17 seconds
- 74 18 seconds
- 72 19 seconds
- 70 20 + seconds