

REC Unit 3: Physics and Robotics

Catalog No.	77-8105-0030
Category	Mobile Robotics
Duration	15 Hours
Software Supplied	easyC5

3.1 (Core): Motors and Motor Speed

What is a Motor?
Angular Velocity
Worksheet: Angular Velocity
Section 3.1 Review

3.2 (Activity): Angular Velocity

Safety Rules Review
Bench Testing the BaseBot Motors
Bench Testing Motor 2
Bench Testing the Spare Motor

3.3 (Core): DC Motors: Types and Uses

DC versus AC current
Wet Cell Batteries
Dry Cell Batteries
Rechargeable Batteries
Motor Types
Worksheet: DC Motor Scavenger Hunt
Section 3.3 Review

3.4 (Core): Gears and Gear Trains

Gears and Gear Types
Gear Anatomy
Mechanical Advantage and Gear Ratios
Compound Gear Trains
Worksheet: Gear Parameters
Section 3.4 Review

3.5 (Activity): Gear Trains

(Activity): Gear Trains - Fundamental

Building the Gear Train Tester

Working With Gear Trains

Working with Compound Gear Trains

Gear Trains Activity Conclusion

(Activity): Gear Trains - Advanced

Building the Gear Train Tester

Working with Gear Trains

Working with Compound Gear Trains

3.6 (Core): Fundamentals of Linear Motion

Linear Motion

Linear Velocity

Linear Acceleration

Position-Time Graphs

Velocity-Time Graphs

Worksheet: Graphing and Linear Motion

Section 3.6 Review

3.7 (Activity): Linear Motion

(Activity): Linear Motion - Fundamental

Timing the Robot

Graphing PWM and Speed

Linear Motion Activity Conclusion

(Activity): Linear Motion - Advanced

Timing the Robot Moving Forward

Timing the Robot in Reverse

Graphing PWM and Speed

3.8 (Core): Rotational Dynamics

Rolling versus Slipping
Velocity Relationships
Wheel Rollout
Angular Acceleration
Worksheet: Rotational Dynamics
Section 3.8 Review

3.9 (Activity): Linear and Angular Velocity

(Activity): Linear and Angular Velocity - Fundamental
Measuring Gear Train Efficiency
Wheel Rollout and Linear Velocity
Wheel Diameter
Activity Conclusion
(Activity): Linear and Angular Velocity - Advanced
Measuring Gear Train Efficiency
Wheel Rollout and Linear Velocity
Wheel Diameter

3.10 (Core): Newton's Laws

Newton's Laws of Motion
Weight
Force and Motion
Worksheet: Force
Section 3.10 Review

3.11 (Activity): Weight

Finding the Speed of the BaseBot
Increasing Speed
Adding Weight

3.12 (Core): Friction and Traction

Friction
Static and Kinetic Friction
Rolling Friction
Traction

Worksheet: Friction

Section 3.12 Review

3.13 (Activity): Coefficients of Friction

Friction With Plastic Wheels

Friction With Rubber Tires

3.14 (Core): Torque

Torque

Torque Acting on a Gear

Torque Acting on a Wheel

Stall Torque

Worksheet: Torque

Section 3.14 Review

3.15 (Activity): Test Motor Torque

Torque Tester

The Torque Test Program

Testing Torque

3.16 (Core): Gear Ratios and Torque

Gear Ratios and Torque

Torque–Velocity Tradeoffs

Worksheet: Gear Ratios and Design Trade-Offs

Section 3.16 Review

3.17 (Activity): Hill Climb

(Activity): Hill Climb - Fundamental

Building the Hill

Hill Climb Trials

Hill Climb Conclusion

(Activity): Hill Climb - Advanced

Building the Hill

Hill Climb Trials

3.18 (Core): Power

Power and Electrical Energy

Work and Power

Motor Curves

Worksheet: Power

Section 3.18 Review

3.19 (Project): Tractor Pull

(Project): Tractor Pull - Fundamental

Overview

Building the Sled

Specifications

Tractor Pull Conclusion

(Project): Tractor Pull - Advanced

Overview

Building the Sled

Specifications

Unit 3 Conclusion