

Robotics Engineering Curriculum (REC)

Robotics Engineering Curriculum (REC) provides a comprehensive study program of engineering concepts through relevant activities and projects using the award winning Vex Robotics hardware and EasyC® robotic programming software.

Curriculum Mapped to National Standards

- ATLAS of Science Literacy
- ITEEA Standards for Technological Literacy
- NCTM Principles & Standards for School Mathematics
- Next Generation Science Standards
- GA - Foundations of Engineering Technology

Course Outlines

Year 1, Semester 1

■ Unit 1: Introduction to Robotics

- 1.1 (Core): Introduction to Robotics
- 1.2 (Core): The Design Cycle
- 1.3 (Activity): Engineering Notebook
- 1.4 (Core): Safety
- 1.5 (Core): The VEX Robot
- 1.6 (Activity): Vex Components
- 1.7 (Core): Fasteners
- 1.8 (Activity): Chassis Construction
- 1.9 (Core): Drive Train
- 1.10 (Activity): Drive Train Construction
- 1.11 (Core): Robot Controller
- 1.12 (Activity): Wiring the Vex Controller and Battery
- 1.13 (Core): Radio Control
- 1.14 (Activity): Using Radio Control
- 1.15 (Core): Dual Joystick Control (Tank)
- 1.16 (Activity): Tank Control
- 1.17 (Core): Single Joystick Control (Arcade)
- 1.18 (Activity): Arcade Control Operation
- 1.19 (Core): Robot Systems Design
- 1.20 (Activity): Adding Components to the BaseBot
- 1.21 (Project): Motion Path Challenge

■ Unit 2: Introduction to VEX Programming

- 2.1 A (Core): Basic Motor Control
- 2.1 B (Activity) Programming Components
- 2.2 (Activity): Draw a Line
- 2.3 (Core): Pseudocode and Turns
- 2.4 (Activity): Make a Square
- 2.5 (Core): Variables, Constants and Comments
- 2.6 (Activity): Apply Constants, Variables, and Comments
- 2.7 (Core): Tools in easyC
- 2.8 (Activity): Using easyC Tools
- 2.9 (Core): Dead Reckoning and User Functions
- 2.10 (Activity): Follow a Complex Path
- 2.11 (Core): Conditional Statements
- 2.12 (Activity): Modifying the GoForward Function
- 2.13 (Core): Loops
- 2.14 (Activity): Make Multiple Squares
- 2.15 (Core): Simplified Symbols, Logical Operators, and Integer Math
- 2.16 (Activity): Drawing Shapes
- 2.17 (Project): Fine Motor Control

■ Unit 3: Physics and Robotics

- 3.1 (Core): Motors and Motor Speed
- 3.2 (Activity): Angular Velocity
- 3.3 (Core): DC Motors: Types and Uses
- 3.4 (Core): Gears and Gear Trains
- 3.5 (Activity): Gear Trains
- 3.6 (Core): Fundamentals of Linear Motion
- 3.7 (Activity): Linear Motion
- 3.8 (Core): Rotational Dynamics
- 3.9 (Activity): Linear and Angular Velocity
- 3.10 (Core): Newton's Laws
- 3.11 (Activity): Weight
- 3.12 (Core): Friction and Traction
- 3.13 (Activity): Coefficients of Friction
- 3.14 (Core): Torque
- 3.15 (Activity): Test Motor Torque
- 3.16 (Core): Gear Ratios and Torque
- 3.17 (Activity): Hill Climb
- 3.18 (Core): Power
- 3.19 (Project): Tractor Pull

Year 1, Semester 2

■ Unit 4: Sensors

- 4.1 (Core): Introduction to Sensors
- 4.2 (Activity): Open-Loop vs. Closed-Loop Navigation
- 4.3 (Core): Open-Loop vs. Closed-Loop Systems
- 4.4 (Core): Introduction to Vex Kit Sensors
- 4.5 (Activity): Bumper Car
- 4.6 (Core): Ultrasonic Sensors
- 4.7 (Activity): Ultrasonic Rangefinder
- 4.8 (Activity): Warn and Avoid with Speaker
- 4.9 (Core): Following Lines
- 4.10 (Activity): The Line-Following Sensor
- 4.11 (Activity): Line Following
- 4.12 (Unit Project): Bumper Books

■ Unit 5: Arms and End Effectors

- 5.1 (Core): Introduction to Robotic Arms, Degrees of Freedom
- 5.2 (Activity): Robotic Arm Construction
- 5.3 (Core): Mass, Weight, Center of Weight & Torque
- 5.4 (Activity): Center of Weight of BaseBot
- 5.5 (Core): Relationship of Torque, Gear Ratio and Weight of Payload
- 5.6 (Activity): Stall Torque
- 5.7 (Core): Remote Control; Limit Switches
- 5.8 (Activity): Windshield Wiper
- 5.9 (Core): End Effectors
- 5.10 (Activity): End Effector

■ Unit 6: REC 1 Project

- 6.1 (Project): Ultrasonic Trainyard Challenge

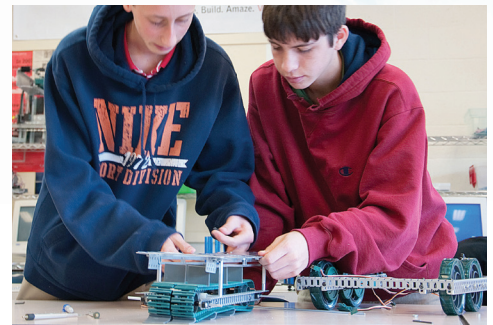
Year 2, Semester 1

■ Unit 7: Introduction to Electronics

- 7.1 (Core): Fundamentals of Electricity
- 7.2 (Core): Components and Schematics
- 7.3 (Activity): Schematics and Breadboards
- 7.4 (Core): Ohm's Law & Making Measurements
- 7.5 (Activity): Using a Multimeter & Ohm's Law
- 7.6 (Core): Circuits
- 7.7 (Activity): Series and Parallel Circuits
- 7.8 (Core): Feedback
- 7.9 (Activity): Blinking LED
- 7.10 (Core): Working With easyC® & Sensors
- 7.11 (Activity): Integrating Hardware & Software
- 7.12: Final Project

■ Unit 8: Mechanical Properties

- 8.1 (Core): Safety and Best Practices
- 8.2 (Core): Chain and Sprockets
- 8.3 (Activity): Testing Chain and Sprockets
- 8.4 (Core): Locomotion Systems
- 8.5 (Activity): Building the Tumblebot
- 8.6 (Core): My Robot Features
- 8.7 (Activity): Program the Tumblebot Drivetrain
- 8.8 (Core): Using the easyC® Text Editor
- 8.9 (Activity): Writing an Arcade Function
- 8.10 (Core): Advanced easyC® Functions
- 8.11 (Activity): Introduction to Freeze Tag
- 8.12 (Core): Adding Autonomous Control
- 8.13 (Project): Freeze Tag



Year 2, Semester 1 (continued)

■ Unit 9: Advanced C Programming

- 9.1 (Core): Proportional Control
- 9.2 (Activity): Using Proportional Control
- 9.3 (Core): Derivative Control
- 9.4 (Activity): Using Derivative Control
- 9.5 (Core): PID Control
- 9.6 (Activity): Integral Control
- 9.7 (Core): Data Filtering
- 9.8 (Activity): Data Filtering & Graceful Degradation
- 9.9 (Core): Encoders
- 9.10 (Activity): Integrated Motor Encoders and PID Control
- 9.11 (Core): Behavioral Robotics
- 9.12 (Activity): Build a Vacuuming Robot
- 9.13 (Core): Organizing Behaviors
- 9.14 (Activity): Writing a Roombot Behavior
- 9.15 (Core): Random Turns
- 9.16 (Activity): Generating Random Numbers

Year 2, Semester 2

■ Unit 10: Industrial Robotic Arms

- 10.1 (Core): Industrial Robots
- 10.2 (Activity): Building a Turret
- 10.3 (Core): Potentiometers
- 10.4 (Activity): Installing the Potentiometer
- 10.5 (Core): Robotic Movement
- 10.6 (Activity): Completing the Arm
- 10.7 (Core): Robotic Integration
- 10.8 (Project): Pass the Workpiece

■ Unit 11: Advanced Mechanics

- 11.1 (Core): Lift Systems
- 11.2 (Activity): Building a Lift Mechanism
- 11.3 (Core): Advanced Gear Systems
- 11.4 (Activity): Rack and Pinion Test Stand
- 11.5 (Core): Roller and Conveyors

■ Unit 12: REC 2 Project

- 12.1 (Project): Bucket Battle

Robotics Engineering Curriculum (REC) (continued)

REC Year 1		Sem 1 Content	Sem 2 Content	Year 1: All-inclusive	REC Year 2		Sem 1 Content	Sem 2 Content	Year 1: All-inclusive
LMS / E-learning Content	Unit 1: Introduction to Robotics	•		•	LMS / E-learning Content	Unit 7: Introduction to Electronics	•		•
	Unit 2: Introduction to Vex Programming	•		•		Unit 8: Mechanical Properties	•		•
	Unit 3: Physics and Robotics	•		•		Unit 9: Advanced C Programming	•		•
	Unit 4: Sensors		•	•		Unit 10: Industrial Robotic Arms		•	•
	Unit 5: Arms and End Effectors		•	•		Unit 11: Advanced Mechanics		•	•
	Unit 6: Project		•	•		Unit 12: Project		•	•
	Teachers Guide - Semester 1	•		•		Teachers Guide - Semester 1	•		•
	Teachers Guide - Semester 2		•	•		Teachers Guide - Semester 2		•	•
	EasyC software (10/20/30 seat license)			•		Advanced Gear Kit			•
	REC 1 Bundle VEX Kit:			•		High Strength Sprocket and Chain Kit			•
	◇ VEX Cortex microcontroller			•		Worm Gearbox Bracket			•
	◇ VEXnet Joystick			•		Rack Gearbox Bracket			•
	◇ AAA joystick batteries and charger			•		Bevel Gearbox Bracket			•
	◇ 7.2V robot battery and charger			•		Potentiometer Kit (2)			•
	◇ Robotic programming cable			•		Linear Slide kit			•
	◇ VEX hardware: metal, gears, wheels			•		Continuous Rotation Motor			•
◇ Ultrasonic Range Finder Kit			•	VEX Y Cable			•		
◇ Line Follower Kit			•	VEX PWM Cables			•		
				VEX Water Wheels			•		
				Digital Multimeter			•		
				Wire Cutter			•		
				Pliers			•		
				Breadboard			•		
				Resistors			•		
				Springs			•		
				Photo resistors			•		
				Capacitors			•		
				LM555 Timer			•		
				LED's			•		
				Transistors			•		
				Toggle Switches			•		
				9 volt battery			•		
				Storage Box			•		

Note: additional items required (not supplied)

Ordering Information

REC Curriculum

Item	Product Code
REC 1	
20 Student Bundle	REC1-FULL-0020
30 Student Bundle	REC1-FULL-0030
REC 2	
20 Student Bundle	REC2-FULL-0020
30 Student Bundle	REC2-FULL-0030
Curriculum Only	
REC 1 - Semester 1	REC1-CURR-SEM1
REC 1 - Semester 2	REC1-CURR-SEM2
REC 2 - Semester 1	REC2-CURR-SEM1
REC 2 - Semester 2	REC2-CURR-SEM2

Contact Us:

intelitek 

Ronald A. Williams, Ltd.
1703 N. Parham Rd.
Suite 120
Richmond, VA 23229

800-752-6968
804-282-8239
804-282-4087 FAX
www.rawledu.com
info@rawledu.com