

PUBLIC SCHOOLS OF EDISON TOWNSHIP
OFFICE OF CURRICULUM AND INSTRUCTION



Robotics 2

Length of Course:	Full Year
Elective/Required:	Elective
Schools:	High School
Eligibility:	Grade 10-12
Credit Value:	5 Credits
Date Approved:	December 22, 2020

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Course Description

Robotics two is the second level of the robotics program. The knowledge and skills acquired will hopefully inspire young people to be science and technology leaders and innovators, by engaging them in exciting mentor-based programs that build science, engineering, and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership. Robotics 2 students will embark on a several month season of the intense design, building, coding, testing, and competing of a robot they build.

Units Of Study

Unit	Focus
1	Safety and Resource Management
2	FTC Season
3	Community Outreach
4	Independent Robotics
5	Team Building

Unit 1: Safety and Resource Management

<p>Targeted Standards</p>	<p>8.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6 8.2.12.ITH.1 8.2.12.ITH.2 8.2.12.ITH.3 8.2.12.NT.1 8.2.12.NT.2 8.2.12.ETW.1 8.2.12.ETW.2 8.2.12.ETW.3 8.2.12.EC.1 8.2.12.EC.2 8.2.12.EC.3 8.2.12.ETW.4 9.3.12.AC.3 9.3.12.AC.5 9.3.12.AC.6 9.3.12.AC-CST.5 9.3.12.AC-CST.9 9.3.12.AC- DES.19.3.12.AC-DES.2 9.3.12.AC-DES.5 9.3.12.AC-DES.6 9.3.12.AC-DES.7 9.3.ST.19.3.ST.2 9.3.ST.3 9.3.ST.4 9.3.ST.5 9.3.ST.6 9.3.ST-ET.1 9.3.ST-ET.29.3.ST-ET.39.3.ST-ET.4 9.3.ST-ET.59.3.ST-ET.6 9.3.ST-SM.1 9.3.ST-SM.2 9.3.ST-SM.3 9.3.ST-SM.4 9.4.12.CI.19.4.12.CI.2 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2 9.4.12.CT.3 9.4.12.CT.4 9.4.12.IML.3 RST.9-10.3. RST.9-10.4 RST.9-10.7. WHST.9-10.6. WHST.9-10.7.RST.11-12.3. RST.11-12.4. RST.11-12.7. WHST.11-12.6. WHST.11-12.7</p>
<p>Unit Objectives/ Conceptual Understandings</p>	<p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> ● Safety is needed in everything. ● Accurate measurements and units define the world of engineering. ● The use of the design loop in engineering. ● Resources are vital and should be managed effectively.
<p>Essential Questions</p>	<ul style="list-style-type: none"> ● Why is safety important? ● Why are accurate measurements important? ● Why is the design loop cyclical? Do you ever stop designing and improving? ● Why should you always be aware of resources and the impacts of using them?
<p>Unit Assessment</p>	<p><i>What is the evidence that students have achieved the targeted standards/unit objectives?:</i></p> <ul style="list-style-type: none"> ● Classroom Safety Test ● Tool Safety Test

Core Content Objectives		Instructional Action	
Concepts What students will know	Skills What students will be able to do	Activities/ Strategies Technology Implementation Interdisciplinary Connections	Assessment Check Points
<ul style="list-style-type: none"> • How to operate safely while working in or out of the classroom. • How to make accurate measurements. • The steps of the design loop and how to incorporate them into projects. • Understand where the resources used come from and how to mitigate waste. • The process of recycling. 	<ul style="list-style-type: none"> • Work in and out of the classroom safely. • Understand key safety features of a tool or machine. • Understand the importance of safety. • Measure accurately • Read and understand the steps in the design loop. • Think creatively and outside of the box. • Know when a project is still a prototype or finished. • Think critically about design challenges. • Understand simple design and engineering constraints. • Identify where their resources come from. • Identify what is waste and what is reusable. 	<ul style="list-style-type: none"> • Introduction and Safety Task Statement • LATIC Activity Lists <ul style="list-style-type: none"> ○ Introductions ○ Notebook ○ Safety Day 1-2 ○ Safety Day 3-5 • LATIC/FTC Daily Log 	<ul style="list-style-type: none"> • Classroom Safety Map • Safety Demos • Safety Presentations • Resource Management Project • Resource Management Logs
Resources Essential materials, supplementary materials, links to best practice <ul style="list-style-type: none"> • Chromebooks • Batteries • Misc. Electronics • Misc. Hand tools • Zona Saw • Easy Cutter • Foam Core • Acrylic • Belt Sander • X-acto Knife • Drills • Drill Bits 		Instructional Adjustments Modifications, student difficulties, possible misunderstandings <ul style="list-style-type: none"> • <i>Struggling Students:</i> Extended time, assist w/ organization, use of computer, emphasize/highlight key concepts, recognize success, frequent check-in about progress, making sure understands directions, copy of class notes/PowerPoints, read directions aloud, modified project parameters and/or rubric of file setup, storage using appropriate line weights, scales & text. • <i>ELL Students:</i> Ensure that students understand directions, copy of class notes/PowerPoints, read and clarify directions aloud, provide a list and definitions of vocabulary words. • <i>Special Education:</i> Students will be provided with all IEP accommodations and modifications. 	

Unit 2: FTC SEASON

Targeted Standards	8.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6 8.2.12.ITH.1 8.2.12.ITH.2 8.2.12.ITH.3. 8.2.12.NT.1 8.2.12.NT.2 8.2.12.ETW.1 8.2.12.ETW.2 8.2.12.ETW.3 8.2.12.EC.1 8.2.12.EC.2 8.2.12.EC.3 8.2.12.ETW.4 9.3.12.AC.3 9.3.12.AC.5 9.3.12.AC.6 9.3.12.AC-CST.5 9.3.12.AC-CST.9 9.3.12.AC- DES.19.3.12.AC-DES.2 9.3.12.AC-DES.5 9.3.12.AC-DES.6 9.3.12.AC-DES.7 9.3.ST.19.3.ST.2 9.3.ST.3 9.3.ST.4 9.3.ST.5 9.3.ST.6 9.3.ST-ET.1 9.3.ST-ET.29.3.ST-ET.39.3.ST-ET.4 9.3.ST-ET.59.3.ST-ET.6 9.3.ST-SM.1 9.3.ST-SM.2 9.3-ST-SM.3 9.3.ST-SM.4 9.4.12.CI.19.4.12.CI.2 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2 9.4.12.CT.3 9.4.12.CT.4 9.4.12.IML.3 RST.9-10.3. RST.9-10.4 RST.9-10.7. WHST.9-10.6. WHST.9-10.7.RST.11-12.3. RST.11-12.4. RST.11-12.7. WHST.11-12.6. WHST.11-12.7
Unit Objectives/ Conceptual Understandings	<p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> ● Designing should be done with a task or tasks in mind. ● Building a robot is limited by material constraints. ● Teamwork is a vital skill that transcends engineering. ● Keeping an Engineering Binder is important to track progress. ● Competitions should take place with gracious professionalism.
Essential Questions	<ul style="list-style-type: none"> ● What is more important, the overarching goal or the steps along the way? ● Is teamwork always needed? ● Why should you keep a log of your engineering process? ● Why is winning not the most important thing?
Unit Assessment	<p><i>What is the evidence that students have achieved the targeted standards/unit objectives?:</i></p> <ul style="list-style-type: none"> ● Unit test ● FTC Competition Prompt

Core Content Objectives		Instructional Action	
Concepts What students will know	Skills What students will be able to do	Activities/Strategies Technology Implementation Interdisciplinary Connections	Assessment Check Points
<ul style="list-style-type: none"> • How to work in teams • How to design based of a need • How to redesign based off trial and error • How to compete with gracious professionalism • How to build a tank drive chassis • How to build an omni drive chassis • How to build robotic limbs • How to build a variety of claws based off need • How to code using Block Coding • How to create autonomous systems using sensors and cameras • Gear ratios • How important it is to keep a detailed 	<ul style="list-style-type: none"> • Work on a team • Design based of a need • Fail up • Redesign based off data gathered during testing • Identify and build a variety of chassis • Create robotics limbs • Understand the grammar and syntax of coding • Create autonomous systems • Create complex mechanical systems • Create a detailed log of work 	<ul style="list-style-type: none"> • FTC Daily Logs • FTC Notebook Checks • Competition Scouting 	<ul style="list-style-type: none"> • Design a robot based on the constraints of the competition and materials at hand. • Build a robot with time constraints working together. • Code robot by understanding the needs and capabilities of motion of the robot.
<p>Resources Essential materials, supplementary materials, links to best practice</p> <ul style="list-style-type: none"> • Chromebooks • Batteries • Misc. Electronics • Misc. Hand tools • Zona Saw • Easy Cutter • Foam Core • Acrylic • Belt Sander • X-acto Knife • Drills • Drill Bits 		<p>Instructional Adjustments Modifications, student difficulties, possible misunderstandings</p> <ul style="list-style-type: none"> • <i>Struggling Students:</i> Extended time, assist w/ organization, use of computer, emphasize/highlight key concepts, recognize success, frequent check-in about progress, making sure understands directions, copy of class notes/PowerPoints, read directions aloud, modified project parameters and/or rubric of file setup, storage using appropriate line weights, scales & text. • <i>ELL Students:</i> Ensure that students understand directions, copy of class notes/PowerPoints, read and clarify directions aloud, provide a list and definitions of vocabulary words. • <i>Special Education:</i> Students will be provided with all IEP accommodations and modifications. 	

Unit 3: COMMUNITY OUTREACH

Targeted Standards	.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6 8.2.12.ITH.1 8.2.12.ITH.2 8.2.12.ITH.3 8.2.12.NT.1 8.2.12.NT.2 8.2.12.ETW.1 8.2.12.ETW.2 8.2.12.ETW.3 8.2.12.EC.1 8.2.12.EC.2 8.2.12.EC.3 8.2.12.ETW.4 9.3.12.AC.3 9.3.12.AC.5 9.3.12.AC.6 9.3.12.AC-CST.5 9.3.12.AC-CST.9 9.3.12.AC- DES.19.3.12.AC-DES.2 9.3.12.AC-DES.5 9.3.12.AC-DES.6 9.3.12.AC-DES.7 9.3.ST.19.3.ST.2 9.3.ST.3 9.3.ST.4 9.3.ST.5 9.3.ST.6 9.3.ST-ET.1 9.3.ST-ET.29.3.ST-ET.39.3.ST-ET.4 9.3.ST-ET.59.3.ST-ET.6 9.3.ST-SM.1 9.3.ST-SM.2 9.3-ST-SM.3 9.3.ST-SM.4 9.4.12.CI.19.4.12.CI.2 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2 9.4.12.CT.3 9.4.12.CT.4 9.4.12.IML.3 RST.9-10.3. RST.9-10.4 RST.9-10.7. WHST.9-10.6. WHST.9-10.7.RST.11-12.3. RST.11-12.4. RST.11-12.7. WHST.11-12.6. WHST.11-12.7
Unit Objectives/ Conceptual Understandings	<i>Students will understand that:</i> <ul style="list-style-type: none"> ● An Engineers duty is to improve the world we live in ● Technology and knowledge should be shared and not hoarded ● It is never to early to start contributing or helping others
Essential Questions	<ul style="list-style-type: none"> ● Is there a moral obligation to share knowledge? ● What is the purpose of innovation? ● Why should we help others if it isn't easy or provides extra work?
Unit Assessment	<i>What is the evidence that students have achieved the targeted standards/unit objectives?:</i> <ul style="list-style-type: none"> ● Student interactions within First Tech Challenge teams and season. Students will be encouraged to help other teams at meets and competitions despite the possibility that doing so could hurt their own competitive advantage. ● FTC Gracious Professionalism

Core Content Objectives		Instructional Action	
Concepts What students will know	Skills What students will be able to do	Activities/Strategies Technology Implementation Interdisciplinary Connections	Assessment Check Points
<ul style="list-style-type: none"> • How to thoughtfully identify deficits in skills or knowledge. • How to plan for short term and long term systematic change. • Inequalities across all spectrums exist • When and how to offer help 	<ul style="list-style-type: none"> • Identify deficits in skills or knowledge of others and professionally provide assistance to fill them. • Create long term and short term community outreach programs • Acknowledge cultural or economic insecurities • Offer help for peers when needed 	<ul style="list-style-type: none"> • Soft Skills Exercises related to Community outreach and helping others. • Girls in Robotics Day • Gracious Professionalism through FIRST • LATIC/FTC Daily Log • Discussions on what can an Individual do to help- how powerful is one person alone? What about a group? 	<ul style="list-style-type: none"> • Teacher observation • Completion of assigned work • Work Habit Evaluation form • Teacher designed quiz • Presentations • Written Responses • Essays • Quizzes • Tests
Resources Essential materials, supplementary materials, links to best practice <ul style="list-style-type: none"> • Chromebooks • Batteries • Misc. Electronics • Misc. Hand tools • Zona Saw • Easy Cutter • Foam Core • Acrylic • Belt Sander • X-acto Knife • Drill Bits • Misc. Motors • Misc. Servos • Misc. Gears 		Instructional Adjustments Modifications, student difficulties, possible misunderstandings <ul style="list-style-type: none"> • <i>Struggling Students:</i> Extended time, assist w/ organization, use of computer, emphasize/highlight key concepts, recognize success, frequent check-in about progress, making sure understands directions, copy of class notes/PowerPoints, read directions aloud, modified project parameters and/or rubric of file setup, storage using appropriate line weights, scales & text. • <i>ELL Students:</i> Ensure that students understand directions, copy of class notes/PowerPoints, read and clarify directions aloud, provide a list and definitions of vocabulary words. • <i>Special Education:</i> Students will be provided with all IEP accommodations and modifications. 	

Unit 4: INDEPENDENT ROBOTICS

Targeted Standards	.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6 8.2.12.ITH.1 8.2.12.ITH.2 8.2.12.ITH.3 8.2.12.NT.1 8.2.12.NT.2 8.2.12.ETW.1 8.2.12.ETW.2 8.2.12.ETW.3 8.2.12.EC.1 8.2.12.EC.2 8.2.12.EC.3 8.2.12.ETW.4 9.3.12.AC.3 9.3.12.AC.5 9.3.12.AC.6 9.3.12.AC-CST.5 9.3.12.AC-CST.9 9.3.12.AC-DES.19.3.12.AC-DES.2 9.3.12.AC-DES.5 9.3.12.AC-DES.6 9.3.12.AC-DES.7 9.3.ST.19.3.ST.2 9.3.ST.3 9.3.ST.4 9.3.ST.5 9.3.ST.6 9.3.ST-ET.1 9.3.ST-ET.29.3.ST-ET.39.3.ST-ET.4 9.3.ST-ET.59.3.ST-ET.6 9.3.ST-SM.1 9.3.ST-SM.2 9.3-ST-SM.3 9.3.ST-SM.4 9.4.12.CI.19.4.12.CI.2 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2 9.4.12.CT.3 9.4.12.CT.4 9.4.12.IML.3 RST.9-10.3. RST.9-10.4 RST.9-10.7. WHST.9-10.6. WHST.9-10.7.RST.11-12.3. RST.11-12.4. RST.11-12.7. WHST.11-12.6. WHST.11-12.7
Unit Objectives/ Conceptual Understandings	<p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> ● A broad foundational education will be just as valuable as a deep specific knowledge ● Thorough and precise planning is just as important to the process as any other step ● Cataloging your work process through an engineering log is crucial for prosperity and any ownership claims ● Every engineer must follow the design process
Essential Questions	<ul style="list-style-type: none"> ● Why is it important to have a strong foundational education before pursuing advanced independent projects? ● Is the process or product more important? ● Why is the design circle important? ● Should every project have a true need?
Unit Assessment	<p><i>What is the evidence that students have achieved the targeted standards/unit objectives?:</i></p> <ul style="list-style-type: none"> ● Independent Robotics Project ● Independent Robotics Project Pitch which includes: <ul style="list-style-type: none"> ○ Objectives ○ Materials ○ Cost Breakdown ○ Gantt Charts

Core Content Objectives		Instructional Action	
Concepts What students will know	Skills What students will be able to do	Activities/ Strategies Technology Implementation Interdisciplinary Connections	Assessment Check Points
<ul style="list-style-type: none"> • How to work through the design process • How to plan for short and long term goals • How to catalogue and record a record of work • A broad set of foundational robotics skills and knowledge including mechanical systems, electrical systems, and coding. • When to reach out for help • That it is okay to reach out for help • How to collaborate • When to collaborate • How to independently work and schedule time • How to get past failures and upsets 	<ul style="list-style-type: none"> • Work through the design circle • Plan for short and long term goals • Record their work through the use of daily logs and an Engineering Notebook • Apply the skills and knowledge they have attained over the last three years of the CTE course progression. • Reach out and accept help when needed • Collaborate • Work independently when required • Move past failure and reassess for future goals 	<ul style="list-style-type: none"> • Project based learning • Rubrics • Exit Cards • Presentations • Pre-Assessments • Checklists • Peer Review • Informal Observations/Dialo gues • Project based learning 	<ul style="list-style-type: none"> • Teacher observation • Completion of assigned work • Work Habit Evaluation form • Teacher designed quiz • Presentations • Written Responses • Essays • Quizzes • Tests • Checklists
Resources Essential materials, supplementary materials, links to best practice <ul style="list-style-type: none"> • Chromebooks • Batteries • Misc. Electronics • Misc. Hand tools • Zona Saw • Easy Cutter • Foam Core • Acrylic • Belt Sander • X-acto Knife • Drills • Drill Bits 		Instructional Adjustments Modifications, student difficulties, possible misunderstandings <ul style="list-style-type: none"> • <i>Struggling Students:</i> Extended time, assist w/ organization, use of computer, emphasize/highlight key concepts, recognize success, frequent check-in about progress, making sure understands directions, copy of class notes/PowerPoints, read directions aloud, modified project parameters and/or rubric of file setup, storage using appropriate line weights, scales & text. • <i>ELL Students:</i> Ensure that students understand directions, copy of class notes/PowerPoints, read and clarify directions aloud, provide a list and definitions of vocabulary words. • <i>Special Education:</i> Students will be provided with all IEP accommodations and modifications. 	

Unit 5: TEAM BUILDING

Targeted Standards	.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6 8.2.12.ITH.1 8.2.12.ITH.2 8.2.12.ITH.3 8.2.12.NT.1 8.2.12.NT.2 8.2.12.ETW.1 8.2.12.ETW.2 8.2.12.ETW.3 8.2.12.EC.1 8.2.12.EC.2 8.2.12.EC.3 8.2.12.ETW.4 9.3.12.AC.3 9.3.12.AC.5 9.3.12.AC.6 9.3.12.AC-CST.5 9.3.12.AC-CST.9 9.3.12.AC- DES.19.3.12.AC-DES.2 9.3.12.AC-DES.5 9.3.12.AC-DES.6 9.3.12.AC-DES.7 9.3.ST.19.3.ST.2 9.3.ST.3 9.3.ST.4 9.3.ST.5 9.3.ST.6 9.3.ST-ET.1 9.3.ST-ET.29.3.ST-ET.39.3.ST-ET.4 9.3.ST-ET.59.3.ST-ET.6 9.3.ST-SM.1 9.3.ST-SM.2 9.3-ST-SM.3 9.3.ST-SM.4 9.4.12.CI.19.4.12.CI.2 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2 9.4.12.CT.3 9.4.12.CT.4 9.4.12.IML.3 RST.9-10.3. RST.9-10.4 RST.9-10.7. WHST.9-10.6. WHST.9-10.7.RST.11-12.3. RST.11-12.4. RST.11-12.7. WHST.11-12.6. WHST.11-12.7
Unit Objectives/ Conceptual Understandings	<i>Students will understand that:</i> <ul style="list-style-type: none"> ● Being a good team member is paramount in a 21st century connected community and job market. ● Teamwork is more than just being on a team. ● Individuality is also important when working on a team. ● Diversity is crucial to a well rounded team.
Essential Questions	<ul style="list-style-type: none"> ● Why is it important to be able to work on a team? ● Who benefits from teamwork? ● Is diversity important on a team? ● When should you work on a team and when should you work alone? ● Is delegation teamwork?
Unit Assessment	<i>What is the evidence that students have achieved the targeted standards/unit objectives?:</i> <ul style="list-style-type: none"> ● Leadership Interviews and Reflections ● Adaptability Exercises ● Team Building Exercises ● Breakout Boxes

Core Content Objectives		Instructional Action	
Concepts What students will know	Skills What students will be able to do	Activities/Strategies Technology Implementation Interdisciplinary Connections	Assessment Check Points
<ul style="list-style-type: none"> • How to work on a team. • How to be flexible and adaptable on a team. • How to be a leader and not a boss. • How to collaborate virtually. • How to work through the design process with multiple ideas and mindsets. • How to work through a conflict. 	<ul style="list-style-type: none"> • Work on a team. • Demonstrate flexibility and adaptability on a team • Work through conflict. • Collaborate virtually • Show leadership qualities • Encourage and appreciate diversity on a team • Identify benefits of teamwork. 	<ul style="list-style-type: none"> • Leadership Interviews and Reflections • Adaptability Exercises • Team Building Exercises • Breakout Boxes 	<ul style="list-style-type: none"> • Miscellaneous You Tube videos and TED Talks • FTC Teams • Gracious Professionalism throughout FTC competitions.
Resources Essential materials, supplementary materials, links to best practice <ul style="list-style-type: none"> • Chromebooks • Miscellaneous Classroom Supplies for Team Building Exercises <ul style="list-style-type: none"> ○ String ○ Cups ○ Ladders • Use of Instructional Coach Resources <ul style="list-style-type: none"> ○ Puzzles ○ Games ○ Breakout Boxes ○ Miscellaneous Skill building and Team building Equipment 		Instructional Adjustments Modifications, student difficulties, possible misunderstandings <ul style="list-style-type: none"> • <i>Struggling Students:</i> Extended time, assist w/ organization, use of computer, emphasize/highlight key concepts, recognize success, frequent check-in about progress, making sure understands directions, copy of class notes/PowerPoints, read directions aloud, modified project parameters and/or rubric of file setup, storage using appropriate line weights, scales & text. • <i>ELL Students:</i> Ensure that students understand directions, copy of class notes/PowerPoints, read and clarify directions aloud, provide a list and definitions of vocabulary words. • <i>Special Education:</i> Students will be provided with all IEP accommodations and modifications. 	