

Introduction to Programming Course Outline

In this course, students learn fundamentals of Java programming within WPILib and obtain widely applicable skills in programming that they can transfer to industry credentials. Students will learn fundamental programming concepts such as methods, objects, conditionals, loops, arrays, command-based programming, errors, and troubleshooting. Students apply their knowledge to programming a robot that completes an obstacle course with feedback checkpoints. This course enables students to complete tasks with the XRP robot as well as the Romi robot. In the second semester, students further their knowledge to prepare for the Java SE 8 Programmer Exam or an AP Computer Science Exam using external courses.

Introduction to Programming: Part 1 Modules

Lesson	Learning Objectives	Time
Overview and Java Fundamentals	<ul style="list-style-type: none"> a) Learn about the robotics hardware you might use to learn programming. b) Explore the Java SE 8 Programmer Certification and the body of knowledge needed for the Java Exam. c) Learn how the Java SE 8 Programmer Certification can help you on your future career path. 	1 hour
Hardware Set-up	<ul style="list-style-type: none"> a) Explore the correlation between hardware and software components of a robotics system. b) Install software with built-in repositories of code for the <i>FIRST</i>[®] Robotics Competition. c) Configure the robot hardware and simulation tools for programming. 	2 hours
Programming Robots	<ul style="list-style-type: none"> a) Create a new Robot Project. b) Differentiate between Timed-based and Command-based robot projects. c) Explore operating modes that exist (driver-controlled, autonomous, etc.) and how they are used. d) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Java Basics and Inheritance) and complete the self-assessment to document skills. 	2 hours
Using Methods and Objects	<ul style="list-style-type: none"> a) Initialize an instance of an existing class and pass arguments. b) Understand how to invoke an existing method and pass arguments. c) Navigate and open files in VS Code. d) Call methods on DigitalOutput and Servos in WPILib. e) Control an output (LED or Servo) with a method. f) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Java Basics, Methods, and Encapsulation) and complete the self-assessment to document skills. 	3 hours
Conditionals	<ul style="list-style-type: none"> a) Run code only under specific conditions. b) Write an (if) statement. c) Explore the purpose of operators and how to do comparisons. d) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Operators and Encapsulation) and complete the self-assessment to document your skills. 	3-5 hours

Variables and Equations	<ul style="list-style-type: none"> a) Declare a variable. b) Identify what a data type is. c) Differentiate between integer, decimal, String and Boolean data types. d) Explore ways of controlling robot's speed and direction. e) Write an equation. f) Use basic numerical operators: plus, minus, multiply, and divide. g) Change the Romi's speed and direction using an equation. h) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Data Types and Working with Selected Classes) and complete the self-assessment to document skills. 	3-5 hours
--------------------------------	--	-----------

Intro to Programming: Part 2 Modules

Lesson	Learning Objectives	Time
Command Based Programming	<ul style="list-style-type: none"> a) Differentiate between timed-based and command-based robot projects. b) Write command classes in <i>FIRST</i>Robotics Competition programming. c) Explore robot hardware as a subsystem. d) Analyze gyroscope hardware and use it to control your robot. e) Create and schedule commands for your Romi robot. f) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Java Basics, Methods and Encapsulation, and Working with Inheritance) and complete the self-assessment to document skills. 	3-5 hours
Robot Driving and Inputs	<ul style="list-style-type: none"> a) Understand default commands and how to set them. b) Utilize joystick inputs and pass it to other methods. c) Drive the Romi using the existing reference example. d) Create driving methods and set power to motors. e) Create default commands within the robot container. f) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Java Basics, Methods and Encapsulation, Data Types, and Working with Inheritance) and complete the self-assessment to document skills. 	3-5 hours
Advanced Conditionals and Logical Operators	<ul style="list-style-type: none"> a) Write a compound conditional statement. b) Understand the different logical operators. c) Use a timer class to control robot behavior. d) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Operators and Decision Constructs) and complete the self-assessment to document skills. 	3-5 hours
Command Groups	<ul style="list-style-type: none"> a) Explore the benefits of command groups. b) Create a command group from a series of actions. c) Create an autonomous routine using command groups. d) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Methods and Encapsulation) and complete the self-assessment to document skills. 	3 hours
Conditionals	<ul style="list-style-type: none"> a) Run code only under specific conditions. b) Write an (if) statement. c) Explore the purpose of operators and how to do comparisons. 	3-5 hours

	d) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Operators and Encapsulation) and complete the self-assessment to document skills.	
Arrays and Loops	<ul style="list-style-type: none"> a) Apply understanding of loops to write a loop. b) Understand arrays and how to create them. c) Use a loop to iterate through an array. d) Utilize the modulo operator to analyze data. e) Understand how to use a WPILib Timer class to control your robot operation over time. f) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Loop Constructs and Arrays) and complete the self-assessment to document skills. 	3-5 hours
Errors and Troubleshooting	<ul style="list-style-type: none"> a) What is an error message, stack trace, and line numbers. b) How to use print statements. c) How to send data to the WPILib Robot Simulator, Smart Dashboard, and Shuffleboard. d) Understand common error messages in <i>FIRST</i> Robotics Competition programming and what they mean. e) Identify skills used in the lesson that apply to the Java SE 8 Programmer Certification (Exceptions) and complete the self-assessment to document skills. 	3-5 hours
External Java	a) Expand knowledge of Java using other sources such as CS Awesome, Code HS, or Jet Brains.	Up to 180 hours