

FTC Java Level 1 Teacher Course Map

A twelve-lesson path from TeleOp flow to measured autonomous repeatability

TEACHER NOTE

Recommended audience: middle- and high-school FTC students. Teach in order when possible; Parts 1-7 build code-reading and TeleOp control, Part 8 transfers those ideas to the StarterBot, and Parts 9-12 build autonomous measurement and feedback.

Course outcomes

- Trace an FTC LinearOpMode from INIT through PLAY, the active loop, STOP, and DISABLED.
- Map Java device names to robot configuration safely and diagnose direction mismatches with telemetry.
- Calculate tank and split-arcade motor commands, including normalization.
- Use encoders for distance and the Control Hub IMU for heading feedback.
- Plan, test, measure, and improve a multi-segment autonomous route using controlled evidence.
- Execute the POWERING ON call-and-clear sequence consistently.

Prerequisites and equipment

CATEGORY	MINIMUM
Student background	Basic arithmetic, signed numbers, reading short Java statements; no prior FTC coding required.
Software	FTC Robot Controller project through OnBot Java or Android Studio; matching Driver Station.
Robot	Two-motor StarterBot for Parts 1-12; rigid REV Control Hub; encoders connected for Parts 9-12.
Test equipment	Stable blocks, gamepad, batteries, tape, tape measure, square/protractor, floor boundary markers.
Safety	POWERING ON poster, designated operator and safety lead, visible DISABLED confirmation before approach.

Sequence at a Glance

Suggested time includes discussion, hands-on practice, and evidence recording

PART	FOCUS	MINUTES	PRIMARY ASSESSMENT
1	TeleOp program flow	60 min	Ordered human TeleOp flow + exit response
2	Motor mapping and direction	60-75	Mapping/direction audit
3	INIT, telemetry, waitForStart	60	State observation record
4	Active control loop	60	Three traced cycles
5	Joystick values	60	Signed-value conversion
6	Power, motion, telemetry	60-75	Predict-observe-verify table
7	Split arcade	60-75	Mix/normalize calculations
8	StarterBot TeleOp transfer	75	Configuration and drive trial
9	Encoder drive 3 feet	75-90	Distance calculation + measured trial
10	IMU right turn 90	60-75	Orientation audit + yaw/error trial
11	Accurate L path	75-90	Route trace + measured course trial
12	Repeatability	80-90	3 baselines, one change, 2-3 retests

Recommended lesson rhythm

1. Predict and identify the evidence students expect.
2. Watch the short whiteboard video with planned pause questions.
3. Trace or calculate on paper before live motion.
4. Complete the POWERING ON gate and supervised test.
5. STOP, visibly confirm DISABLED, then measure and diagnose.
6. Finish with an exit ticket that requires evidence.

Assessment and Readiness

Use observable student actions to decide when to advance

Level 1 completion checklist

DOMAIN	STUDENT CAN...	CHECK
Program flow	Explains INIT, waitForStart, active loop, STOP, and DISABLED.	☐
Hardware mapping	Matches variable, device type, exact configuration name, wiring, and direction.	☐
Input math	Negates Y correctly and calculates/normalizes split-arcade outputs.	☐
Telemetry	Separates commanded values from physical observations and uses both for diagnosis.	☐
Encoder distance	Explains counts-per-inch assumptions and records measured travel.	☐
IMU heading	Matches Hub orientation, verifies yaw sign, and calculates normalized error.	☐
Feedback	Explains tolerance, proportional correction, clipping/minimum power, and timeout.	☐
Route planning	Includes chassis sweep, side boundaries, stopping buffer, and abort criteria.	☐
Experiment	Keeps baseline conditions constant, changes one variable, and compares multiple trials.	☐
Safety	Leads POWERING ON and waits for visible DISABLED before every approach.	☐

Advance, reteach, or extend

- Advance when the student explains the decision path and supports it with code, telemetry, calculation, or measurement.
- Reteach with paper traces or a secured-wheel test when sign, state, or sensor-role confusion remains.
- Extend with servos, additional sensors, modular drive methods, Android Studio/Git workflow, or an AprilTag vision series after the drivetrain baseline is repeatable.

Resource map

PARTS	CORE DOCUMENTS
1-7	Complete student workbook, combined teacher plan, combined answer key, focus guides, role cards, Java source.
8-11	Each part includes lesson plan, student workbook, teacher key, focus guide, Java source, and video page.
12	Lesson plan, student trial record, teacher key, focus guide, and video page; reuses Part 11 Java.
Shared	POWERING ON posters and printable/3D program token resources.