LEGO SPIKE Robotics: SPIKE Essential (Grades 1–5)

This is one of five courses in my ECA proposal for OWIS. The overview document has the full menu, my background and the payment arrangement. Format: ten 1-hour lessons.

1 Overview

Students work in pairs to build LEGO robots and program them to move, react to colours and complete missions. SPIKE Essential is LEGO's robotics kit for primary school: a small hub, two motors, a colour sensor and a small light display, programmed in the SPIKE app with icon blocks (for younger students) or word blocks (for older students).

For students: build a robot, teach it to follow your instructions, and send it on a mission.

2 Objectives

- Build working models from instructions, then change them to solve a problem (thinking skills).
- Write short programs using sequences, loops and simple decisions, and fix them when they don't work (thinking and self-management skills).
- Measure and predict: how far a robot travels for each turn of its wheels (thinking skills, with mathematics).
- Work in a pair with shared roles, builder and programmer, swapping each lesson (social skills), and explain the robot to others (communication skills).

3 Scheme of work

This ten-lesson outline is tentative. The order and pace of lessons will be adjusted to the students' ages, experience and interests.

Lesson	Focus	Students build or do	ATL skill
1	Meet SPIKE	Unpack the kit, connect the hub, make a motor spin	Self-management: caring for equipment
2	Sequences	Program a model to move in a set order of steps	Thinking: putting steps in order
3	Loops and timing	Make a fan or a dancing robot repeat a pattern	Thinking: spotting patterns
4	The colour sensor	Program the robot to react differently to each colour	Research: testing and observing
5	Light and sound	Use the light display and sounds to give feedback	Communication: signals and messages
6	Decisions	"If it sees red, stop; if it sees green, go"	Thinking: cause and effect
7	A driving base	Build a car; measure how far one wheel turn takes it	Thinking: measuring and predicting
8	Mission challenge	Solve simple field missions in competition style	Social: working as a pair
9	Team mission	Design, build and test a mission of the pair's own	Self-management: planning and testing
10	Robot showcase	Families watch robots complete missions; pairs explain how theirs works	Communication: presenting

4 Lesson structure (60 minutes)

Minutes	Stage	What happens
5	Warm-up and kits out	Kits handed out and checked; a quick question about last week
10	New idea	One new idea, shown with a working model
35	Build and test	Pairs build, program, test and improve
10	Share and pack up	Two or three pairs show their robot; parts checklist and pack-up

5 Mixed grades: levels A, B and C

The class shares one core task each lesson, with harder endings:

- **Level A:** follow the build and the program shown. Usually Grades 1–2, with icon blocks.
- **Level B:** change the program to do something new. Usually Grades 3–4, with word blocks.
- **Level C:** invent a new model or mission. Usually Grade 5.

Pairs are matched by level so that both students do real work.

6 Potential competitions

Singapore's National Robotics Competition has a Lower Primary category (ages 7–9) for SPIKE Essential robots, with teams of two or three and a coach. Registration usually closes in early July and the competition runs in August. Interested students could form a team after the course.

7 Requirements

- **Kits:** school SPIKE Essential kits, one per pair of students.
- **Devices:** one device with the SPIKE app per kit. Grades 1–3 need school iPads or laptops; Grades 4–5 can use their own iPads.
- **Room:** the STEM Room (L4), with table space for building.

8 Expected outcomes

By the end of the course, each pair will have built and programmed several robots and completed a mission of their own design. Students should be able to explain, in their own words, how a sequence, a loop and a decision make their robot behave. The course builds confidence with building and coding. It doesn't assume any previous experience.