

- This kit contains over 1,600 individual pieces. Please ensure you are familiar with the contents.
- All the files needed to setup and run your robot can be found at the bottom of the Studica WorldSkills page at <https://www.studica.co/resources-4>
- Documentation & Training Material - <https://docs.wsr.studica.com>

- Training Videos – You can start with the following,

### **Day 1 - Getting started with WorldSkills Mobile Robotics**

<https://www.youtube.com/watch?v=cFx3ld-mhvY>

1. Competition Overview and Requirements
2. Introduction to the World Skills Collection
3. Hardware Construction Tips and Tricks

### **Day 2 – Building a basic robot**

<https://www.youtube.com/watch?v=SBETsYISEag>

1. Mechanical Build
  - Base Structure (Drive System)
  - Drive Type and Working Principles
  - 3 wheeled omni drive build
  - Sample Training Platform
2. Electrical build
  - Sample wiring of the Electrical System

### **Day 3 – Programming in Java**

- <https://www.youtube.com/watch?v=aKBEbiiGRyg&t=1s>

1. Introduction to Programming
2. Starting Java
3. Example Projects for WorldsSkills-<https://github.com/studica/WorldSkills-Example-Projects>
4. Configuring and Testing the SR Camera

### **Day 4 – Core Programming**

- <https://www.youtube.com/watch?v=aSxyphb5jBo>

1. Creating a Sample Project (Java)
2. Basic Digital I/O
3. Cobra Line Sensor Board
4. Sharp I/R Sensor
5. Ultrasonic Distance Sensor
6. Basic Control of a DC Motor
7. Basic Control of a Servo Motor
8. Adding the Shuffleboard user Interface to see data

### **Day 5 - Design of a Basic Robot Control System**

- <https://www.youtube.com/watch?v=YLAldHITJ28>

1. Introduction to Programming the IMU (NavX)
2. Gamepad Setup to Control and test robot functionality.
3. Introduction to Vision with the SR Camera
4. Introduction to the Quick Driver Console
5. Driving the Base Robot
6. Review of Configuring the Titan QUAD


















# Worldskills Mobile Robotics 2023 Parts List


















| Description  | Part #                | Image   | Pack Cont's | In Kit |
|--|-----------------------|---|-------------|--------|
| <b>Electronics and Accessories</b>                   |                       |   |             |        |
| IR Range Sensor (10 cm to 80 cm)                     | <a href="#">40117</a> |    | 1           | 2      |
| IR Range Sensor Bracket                              | <a href="#">40118</a> |    | 1           | 2      |
| Zip Ties, Blue, 150mm (100 pack)                     | <a href="#">70010</a> |    | 100         | 1      |
| 12V 3,000 mAh NiMH Battery Pack, PP45                | <a href="#">70018</a> |    | 1           | 2      |
| NiMH Battery Pack Charger, PP45                      | <a href="#">70019</a> |    | 1           | 1      |
| Powerpole 45 Extension Cable, 14AWG, 50cm            | <a href="#">70021</a> |   | 1           | 2      |
| Robotics Toolbox                                     | <a href="#">70055</a> |  | 1           | 1      |
| Remote Controller - Bluetooth                        | <a href="#">70112</a> |  | 1           | 1      |
| 2.5mm Hex Ball End Screwdriver                       | <a href="#">70142</a> |  | 1           | 1      |
| Hex Key Metric 7 Piece Set (1.5, 2, 2.5, 3, 4, 5, 6) | <a href="#">70144</a> |  | 1           | 1      |
| Combination Wrench, 5.5mm                            | <a href="#">70145</a> |  | 1           | 1      |
| Cobra Line Follower Sensor                           | <a href="#">70151</a> |  | 1           | 1      |
| Titan Quad Motor Controller                          | <a href="#">70152</a> |  | 1           | 1      |
| VMX Cable Pack                                       | <a href="#">70160</a> |  | 1           | 1      |






|   |                       |   |    |   |
|---|-----------------------|---|----|---|
| Titan Cable Pack w/1 CAN Cable & 2 JST-VH to JST-VH Cable | <a href="#">70162</a> |    | 1  | 1 |
| Power Control Panel                                       | <a href="#">70170</a> |    | 1  | 1 |
| VMX Robotics Controller                                   | <a href="#">70176</a> |    | 1  | 1 |
| Servo Extension Cable                                     | <a href="#">70188</a> |    | 1  | 4 |
| Servo Y-Split Cable                                       | <a href="#">70189</a> |    | 1  | 4 |
| 360 Degree LiDAR  | <a href="#">70500</a> |    | 1  | 1 |
| Ultrasonic Distance Sensor                                | <a href="#">70753</a> |    | 1  | 2 |
| Ultrasonic Distance Sensor Bracket                        | <a href="#">40238</a> |    | 1  | 2 |
| Analog Module w/JST-SH to JST-GH Cable                    | <a href="#">70755</a> |    | 1  | 1 |
| PWM cable Set - TJC8 3 pin, 22AWG, F-F - 12 pcs           | <a href="#">71011</a> |   | 12 | 1 |
| Dupont Single Pin, 4 wire, F-F Cable - 2 pack             | <a href="#">71014</a> |  | 2  | 1 |
| 3D Depth Sense Camera                                     | <a href="#">71044</a> |  | 1  | 1 |
| Short Lever Limit Switch (4 pack)                         | <a href="#">72060</a> |  | 4  | 1 |
| Maverick 12V DC Gear Motor w/Encoder                      | <a href="#">75001</a> |  | 1  | 4 |
| Multi-Mode Smart Servo                                    | <a href="#">75002</a> |  | 1  | 2 |
| Smart Robot Servo Programmer                              | <a href="#">75003</a> |  | 1  | 1 |
| 6V DC AA Battery Holder w/TJC8 Female, 22AWG              | <a href="#">75004</a> |  | 1  | 1 |
| Servo Power Block   | <a href="#">75006</a> |  | 1  | 1 |
| Multi-Mode Smart Servo 200                                | <a href="#">75007</a> |  | 1  | 2 |
















U-Channel

|                                    |                          |   |    |   |
|------------------------------------|--------------------------|---|----|---|
| 432mm U-Channel                    | <a href="#">76010</a>    |    | 1  | 2 |
| 336mm U-Channel                    | <a href="#">76012</a>    |    | 1  | 3 |
| 288mm U-Channel (2 pack)           | <a href="#">76013-2</a>  |    | 2  | 2 |
| 144mm U-Channel (2 pack)           | <a href="#">76016-2</a>  |    | 2  | 1 |
| 96mm U-Channel (2 pack)            | <a href="#">76017-2</a>  |    | 2  | 1 |
| 48mm U-Channel (2 pack)            | <a href="#">76018-2</a>  |    | 2  | 4 |
| 288mm Low U-Channel (2 pack)       | <a href="#">76028-2</a>  |    | 2  | 1 |
| Rubber Grommet (10 pack)           | <a href="#">76504-10</a> |    | 10 | 1 |
| U-Channel Bumper (4 pack)          | <a href="#">76505-4</a>  |    | 4  | 1 |
| Rubber Foot (4 pack)               | <a href="#">76506-4</a>  |   | 4  | 1 |
| <b>Flat Beams</b>                  |                          |   |    |   |
| 288mm Flat Beam (2 pack)           | <a href="#">76043-2</a>  |  | 2  | 2 |
| 96mm Flat Beam (2 pack)            | <a href="#">76047-2</a>  |  | 2  | 2 |
| <b>Flat Brackets</b>               |                          |   |    |   |
| 288mm x 40mm Flat Bracket (2 pack) | <a href="#">76061-2</a>  |  | 2  | 1 |
| 192mm x 40mm Flat Bracket (2 pack) | <a href="#">76063-2</a>  |  | 2  | 1 |
| 144mm x 40mm Flat Bracket (2 pack) | <a href="#">76064-2</a>  |  | 2  | 2 |
| 96mm x 40mm Flat Bracket (2 pack)  | <a href="#">76065-2</a>  |  | 2  | 3 |
| 192mm x 96mm Flat Bracket (2 pack) | <a href="#">76066-2</a>  |  | 2  | 1 |
| <b>Irregular Brackets</b>          |                          |   |    |   |

|                                       |                         |   |   |   |
|---------------------------------------|-------------------------|---|---|---|
| 120 Degree Bracket (2 pack)           | <a href="#">76080-2</a> |    | 2 | 3 |
| 90 Degree Bracket (2 pack)            | <a href="#">76081-2</a> |    | 2 | 3 |
| 135 Degree Bracket (2 pack)           | <a href="#">76082-2</a> |    | 2 | 2 |
| 96mm Adjustable Flat Bracket (2 pack) | <a href="#">76083-2</a> |    | 2 | 2 |
| T Bracket (2 pack)                    | <a href="#">76084-2</a> |    | 2 | 1 |
| X Bracket (2 pack)                    | <a href="#">76085-2</a> |    | 2 | 1 |
| Inside U Bracket (2 pack)             | <a href="#">76086-2</a> |    | 2 | 2 |
| L Bracket (2 pack)                    | <a href="#">76087-2</a> |    | 2 | 4 |
| Battery Clip (2 pack)                 | <a href="#">76088-2</a> |    | 2 | 1 |
| Inside L Bracket (2 pack)             | <a href="#">76089-2</a> |    | 2 | 4 |
| <b>Mounting Plates</b>                |                         |   |   |   |
| Motor Mount Plate                     | <a href="#">76140</a>   |  | 1 | 4 |
| Motor Mount Clamp Kit                 | <a href="#">76141</a>   |  | 1 | 4 |
| End Piece Plate (2 pack)              | <a href="#">76143-2</a> |  | 2 | 4 |
| Servo Standard Front Mount            | <a href="#">76144</a>   |  | 1 | 3 |
| Servo Mount Flat Plate                | <a href="#">76145</a>   |  | 1 | 3 |
| Servo Mount Offset Plate              | <a href="#">76146</a>   |  | 1 | 3 |
| Servo Horn 25T                        | <a href="#">76148</a>   |  | 1 | 2 |
| 6mm D-Shaft Servo Hub 25T             | <a href="#">76149</a>   |  | 1 | 2 |
| Servo Arm Extended                    | <a href="#">76150</a>   |  | 1 | 2 |

|   |                           |   |     |   |
|---|---------------------------|---|-----|---|
| Servo Arm                                     | <a href="#">76151</a>     |    | 1   | 2 |
| Servo Hub Pro                                 | <a href="#">76152</a>     |    | 1   | 2 |
| <b>Axles, Slides, Rack &amp; Pinion</b>       |                           |   |     |   |
| 250mm Linear Slide Kit                        | <a href="#">72064</a>     |    | 1   | 1 |
| Slide Rail, 288mm Length, 180mm Stroke        | <a href="#">72066</a>     |    | 1   | 2 |
| Slide Rail, 384mm Length, 240mm Stroke        | <a href="#">72067</a>     |    | 1   | 2 |
| 6mm x 35mm D-Shaft (6 pack)                   | <a href="#">76159-6</a>   |    | 6   | 1 |
| 6mm x 70mm D-Shaft (6 pack)                   | <a href="#">76160-6</a>   |    | 6   | 1 |
| 6mm x 96mm D-Shaft (6 pack)                   | <a href="#">76161-6</a>   |    | 6   | 1 |
| 6mm x 432mm D-Shaft (2 pack)                  | <a href="#">76162-2</a>   |    | 2   | 1 |
| Rack & Pinion Set                             | <a href="#">76170-2</a>   |   | 2   | 1 |
| <b>Standoffs</b>                              |                           |   |     |   |
| 42mm Standoff (12 pack)                       | <a href="#">76180-12</a>  |  | 12  | 1 |
| 48mm Standoff (12 pack)                       | <a href="#">76181-12</a>  |  | 12  | 1 |
| 25mm Standoff (12 pack)                       | <a href="#">76182-12</a>  |  | 12  | 1 |
| <b>Screws, Nuts</b>                           |                           |   |     |   |
| M3 x 8mm Socket Head Cap Screw (pack of 100)  | <a href="#">76200-100</a> |  | 100 | 2 |
| M3 x 10mm Socket Head Cap Screw (pack of 100) | <a href="#">76201-100</a> |  | 100 | 2 |
| M3 x 12mm Socket Head Cap Screw (pack of 100) | <a href="#">76202-100</a> |  | 100 | 2 |
| M3 x 10mm Button Head Cap Screw (pack of 50)  | <a href="#">76203-50</a>  |  | 50  | 1 |

|   |                           |   |     |   |
|---|---------------------------|---|-----|---|
| M3 x 20mm Socket Head Cap Screw (pack of 50)              | <a href="#">76209-50</a>  |    | 50  | 1 |
| M3 x 30mm Socket Head Cap Screw (pack of 50)              | <a href="#">76206-50</a>  |    | 50  | 1 |
| M3 Kep Nut (pack of 100)                                  | <a href="#">76204-100</a> |    | 100 | 2 |
| M3 Nyloc Nut (pack of 100)                                | <a href="#">76205-100</a> |    | 100 | 1 |
| <b>Gears, Sprockets, Pulleys, Belts</b>                   |                           |   |     |   |
| 30 Tooth Bevel Gear 1-to-1 Set (2 pack)                   | <a href="#">76219-2</a>   |    | 2   | 1 |
| 32 Tooth Gear (2 pack)                                    | <a href="#">76220-2</a>   |    | 2   | 2 |
| 64 Tooth Gear (2 pack)                                    | <a href="#">76221-2</a>   |    | 2   | 2 |
| 13 Tooth Bevel Gear, 6mm D-Shaft (2 pack)                 | <a href="#">76223-2</a>   |    | 2   | 1 |
| 26 Tooth Bevel Gear (2 pack)                              | <a href="#">76224-2</a>   |    | 2   | 1 |
| 24 Tooth - Sprocket (2 pack)                              | <a href="#">76226-2</a>   |   | 2   | 1 |
| 32 Tooth Sprocket (2 pack)                                | <a href="#">76227-2</a>   |  | 2   | 1 |
| #25 Chain with Master Links, 5 feet(152cm)                | <a href="#">76230</a>     |  | 1   | 1 |
| 6mm Timing Pulley, 10 Tooth (2 pack)                      | <a href="#">76232-2</a>   |  | 2   | 1 |
| 10mm Timing Belt (1 meter)                                | <a href="#">76233</a>     |  | 1   | 1 |
| <b>Wheels</b>   |                           |   |     |   |
| 125mm All-Terrain Wheel Set                               | <a href="#">76249</a>     |  | 4   | 1 |
| Omni Wheel (100mm, Double Plastic, w/ integrated 6mm Hub) | <a href="#">76260</a>     |  | 1   | 4 |
| <b>Bushings, Bearings, Coupling, Collars and Spacers</b>  |                           |   |     |   |
| Intake Hub Kit  | <a href="#">70210</a>     |  | 1   | 4 |
| Clamping Shaft Hub - V2                                   | <a href="#">76280</a>     |  | 1   | 4 |

|   |                          |   |    |   |
|---|--------------------------|---|----|---|
| 6mm Shaft Hub (4 pack)                                  | <a href="#">76284-4</a>  |    | 4  | 4 |
| Enhanced Wheel Hub Kit                                  | <a href="#">76291</a>    |    | 1  | 4 |
| 6mm D-Shaft Low Profile Clamping Hub                    | <a href="#">76292</a>    |    | 1  | 4 |
| Bushing Bronze 6mm ID x 8mm OD (12 pack)                | <a href="#">76300-12</a> |    | 12 | 1 |
| Bushing Bronze 6mm ID x 14mm OD (12 pack)               | <a href="#">76301-12</a> |    | 12 | 1 |
| Flange Bearing 6mm ID, 14mm OD, 15mm Flange (12 pack)   | <a href="#">76302</a>    |    | 12 | 2 |
| Small Thrust Ball Bearing 6mm ID, 12mm OD (12 pack)     | <a href="#">76325-12</a> |    | 12 | 1 |
| Collar 6mm ID D-Shaft, 12mm OD (6 pack)                 | <a href="#">76304-6</a>  |    | 6  | 2 |
| 1mm Thick M3 Screw Spacer (25 pack)                     | <a href="#">76309-25</a> |    | 25 | 1 |
| Shaft Spacer Plastic 6mm ID x 10mm OD x 1mm L (24 pack) | <a href="#">76305-24</a> |   | 24 | 1 |
| Shaft Spacer Plastic 6mm ID x 10mm OD x 2mm L (24 pack) | <a href="#">76306-24</a> |  | 24 | 1 |
| Shaft Spacer Plastic 6mm ID x 10mm OD x 5mm L (12 pack) | <a href="#">76307-12</a> |  | 12 | 1 |
| Shaft Spacer Plastic 6mm ID x 10mm OD x 20mm L (6 pack) | <a href="#">76308-6</a>  |  | 6  | 1 |
| 2mm Thick M3 Screw Spacer (25 pack)                     | <a href="#">76310-25</a> |  | 25 | 1 |
| 5mm Thick M3 Screw Spacer (10 pack)                     | <a href="#">76311-10</a> |  | 10 | 1 |
| Silicone Rubber Tubing                                  | <a href="#">76410</a>    |  | 1  | 2 |