



possibility of their arbitrary expansion with a popular component base (sensors and components compatible with Arduino, etc.) .

The content of the course and the complete set of the basic set allow you to conduct practical classes, including:

- Assembling a CubeSat satellite;
- Microcontroller practice (educational or professional);
- Practice with simple electronic components;
- Development of control algorithms using sensors of angular velocity, angular position, magnetometer, illumination;
- Uniaxial stabilization and satellite orientation by light source;
- Transmission of data from sensors using radio modules of various types, incl. basics of modulation and coding of a radio signal;
- Shooting with the on-board camera and transmitting the image over the air;
- Application of solar panels and familiarity with the tasks of maintaining energy balance;
- Calculation of the orbital characteristics of the mission and the flight sequence diagram in the software.

Allows you to prepare for the "Satellite Systems" profile of the National Technological Olympiad" and the competitions of the "Applied Space Systems" series of the "Planet Duty Officer" program.

The recommended age of students is **14-18 years old**. Up to **3-4 students** can work with one set. To work **requires a PC or laptop**.

Groups of themes in Education Materials:

➤ Satellite Engineering and Radio Communication

Space unit type: Microsatellite Cube Sat 1U

Central control unit type: Arduino-compatible microcontroller of the STM32 family (Blue Pill or compatible)

Power connectors: Arduino Shield (PBS), PLS, JST

Data interfaces: 2C (main), GPIO, PWM, UART, SPI, CAN

Data connectors: Micro Match 4F, PLS, Arduino Shield (PBS), Micro SD

Wireless interfaces: Bluetooth, VHF Radio

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## Education experience:

- ✓ Overview of modern satellite engineering,
- ✓ Fundamentals of orbital mechanics,
- ✓ microsatellite assembly,
- ✓ Programming of sensors and actuators,
- ✓ Simple algorithms for stabilizing and orienting a spacecraft,
- ✓ Setting up and programming a radio channel,
- ✓ Capturing and transmitting an image

## Engineering skills:

- ✚ Programming of microcontrollers,
- ✚ Radio engineering,
- ✚ Orbital mechanics.

## Hardware and Materials:

- ✚ Microcontroller module,
- ✚ Power module,
- ✚ Expansion (prototyping) module,
- ✚ 3-in-1 position sensor (gyroscope, accelerometer, magnetometer),
- ✚ Light sensor, quantity, 4 pcs,
- ✚ Flywheel motor module,
- ✚ Stepper motor,
- ✚ Flywheel,
- ✚ Solar module,
- ✚ Housing kit (chassis components, panels, holders),
- ✚ Mounting kit,
- ✚ Switching kit,
- ✚ Component kit for introductory workshops,
- ✚ Demountable suspension for Nano satellite model,
- ✚ VHF programmable radio module,
- ✚ On-board camera,
- ✚ VHF software-defined radio platform and interface USB (including antenna),
- ✚ Fasteners for accommodating the radio module

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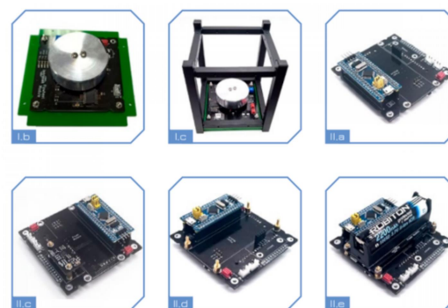
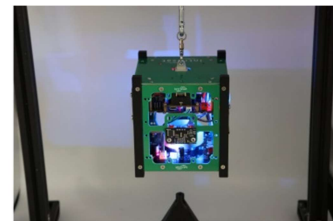
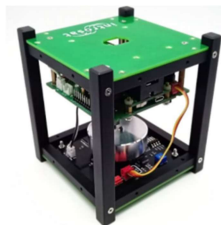
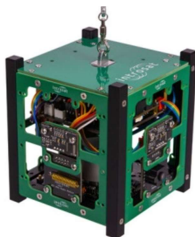
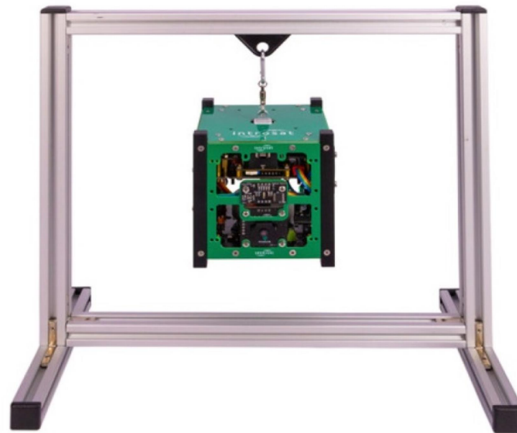
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## Introsat Basic Educational Kit



Laboratory basic set **Introsat™** Used for teaching the basics of satellite engineering and preparing for competitions.

The kits allow you to assemble functional models of satellites of the modern CubeSat format based on Arduino-compatible STM32 microcontrollers, have an open

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architecture and can serve as the basis for individual school projects with the possibility of their arbitrary expansion with a popular component base (sensors and components compatible with Arduino, etc.) .

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