SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track - Undergraduate Space Education (3)

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# A UNIVERSITY NANO SATELLITE FOR STUDENT INTERNATIONAL COOPERATION THROUGH HANDS-ON EDUCATION

**Abstract**

IKUNS (Italian Kenyan University Nano Satellite) is a student project developed in the framework of the ASI (Agenzia Spaziale Italiana) – "La Sapienza – University of Rome" agreement for the management and activity at the Broglio Space Centre (BSC), in particular mainly involving S5LAB (Sapienza Space System and Space Surveillance Laboratory) of La Sapienza and University of Nairobi. The project goal is the design, development, testing and operation of a 6U Cubesat for Earth observation in visual band, partially based on the use of COTS (Commercial Off The Shelf) devices, trading off between minimum cost and reliability. The feasibility study of this satellite was conducted as a part of the Spacecraft Design course, taught in the Space and Astronautical Engineering MSc Course, at Faculty Sapienza University of Rome. The course provides the basis for the design of a spacecraft, including integrated design methodologies and international standard. All the phases of spacecraft design were analyzed, from mission conceptual design to the spacecraft architecture definition and subsystems preliminary design, realization procedures, up to ground testing and qualification for launch. One of the major students

opportunities offered by this project is the possibility to work in ASI Concurrent Engineering Facility (CEF). This facility provides an environment and tools to support a group of experts in different disciplines to exploit a space mission feasibility study (Phase 0 and Phase A) within few weeks. Each student team composed by two or three students managed a different disciplines: System, Mission analysis, Payload, Attitude Determination and Control System, On Board Data Handling, Configuration and Structure, Telemetry Tracking and Command, Ground Segment, Power, Thermal, Costs, Risks and Programming. The first sessions were used for the identification of the spacecraft requirements, while the subsequent dimensioning was performed by iterative process, until a convergence to a preliminary configuration. The paper describes the project and the achieved results, thanks to the concurrent engineering approach integrated in a university course, that guarantees an innovative method: students can acquire an overview of the entire satellite and comprehend how a real project works, increasing their cooperative skills, learning from each other.