



Aalto University
School of Electrical
Engineering

Space Instrumentation

Part 1/2

ELEC-E4220 (5 cr)

Teacher: Esa Kallio

Assistant: Dr. Riku Järvinen

*Aalto University
School of Electrical Engineering
Department of Electronics and Nanoengineering*

Today

Practical issues

Roadmap (*Part ½: Solar System*)

Introduction to Space Instrumentation Part ½

Practical issues

Part 1/2: Solar System

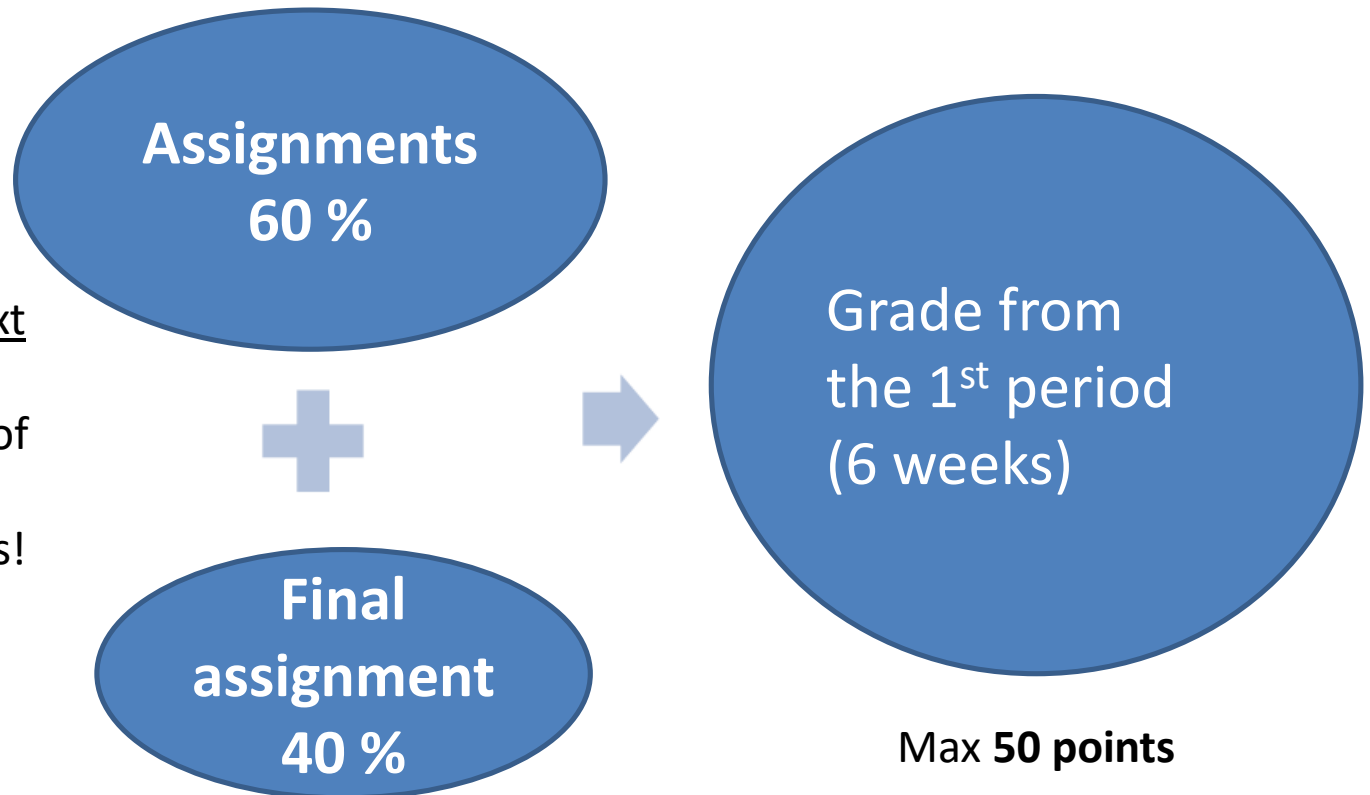
Evaluation and grading of the first period (*six weeks*)

5 assignments,
max 6 p / assignment

⇒ Max **30 points**

- Available on Wednesday
- Return time: by next Fri. at 12:00
- Note: copy&paste of the text
does no give points!
- Self-evaluation

Final assignment:
Max **20 points**



Space science and technology courses

- **ELEC-E4220 Space instrumentation (*part ½*)**
- ELEC-E4230 Microwave Earth Observation instrumentation
- ELEC-E4240 Satellite systems
- ELEC-E4510 Earth Observation
- ELEC-E4520 Space physics [*Physical laws, basic phenomena*]
- ELEC-E4530 Radio astronomy
- ELEC-E4920 Space technology project (5 – 10 cr)
- ELEC-E4930 Special assignments (5 – 10 cr)

Roadmap

Part 1/2: Solar System

REAL LIFE GEOSPACE AND SPACE WEATHER RESEARCH

SPACE REGIONS

4. THE SUN

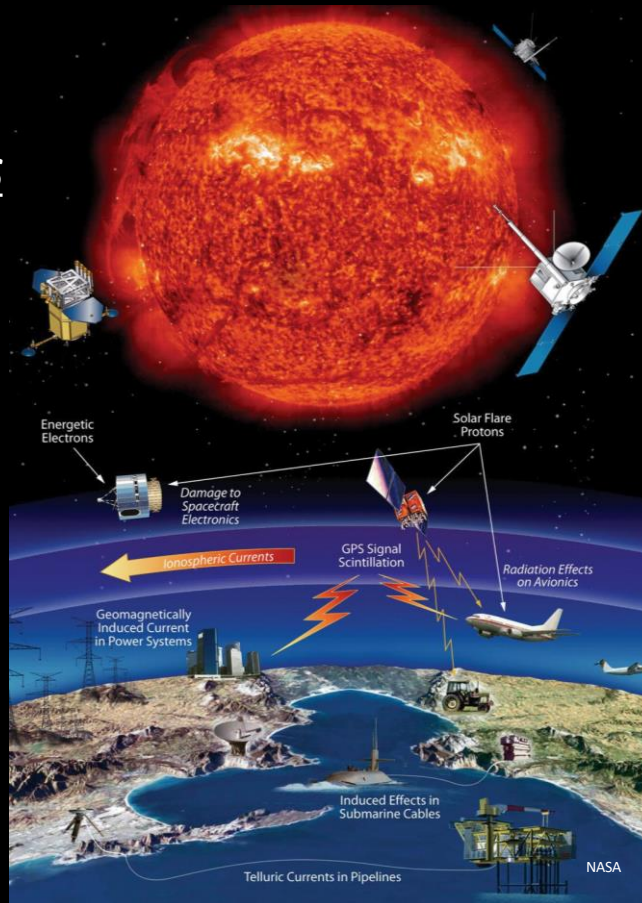
5. SOLAR WIND

6. MAGNETOSPHERE

1. IONOSPHERE

2. ATMOSPHERE

3. SURFACE



SPACE INSTRUMENTS

Multi wavelength camera

Particle instrument

Magnetometer

Radio instrument

Langmuir probe

High energy particle instr.

Radar & ionosonde

Magnetometer, camera

Theory *[data]*

emission and absorption
[SOHO, Stereo, SDO]

velocity distribution function
[ACE, SOHO, etc.]

Ohm's law, reconnection
[ACE, DSCOVR, etc.]

waves and their propagation
[Suomi 100 satellite, etc.]

Debye layer
[QB50 satellites, etc.]

surface charging
[Aalto-1 satellite, etc.]

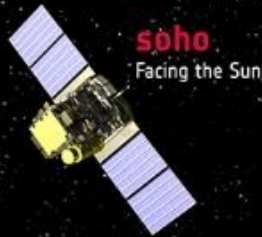
ionosphere
[EISCAT, ionosondes, etc.]

Introduction to Space Instrumentation (*Part 1/2*): Regions & missions



Part 1/2: Space regions to be measured





venus express
Studying Venus' atmosphere

juice
Studying Jupiter's icy moons

bepicolombo
Exploring Mercury

proba-2
Observing coronal
dynamics and solar eruptions

cassini-huygens
Studying the Saturnian system
and landing on Titan

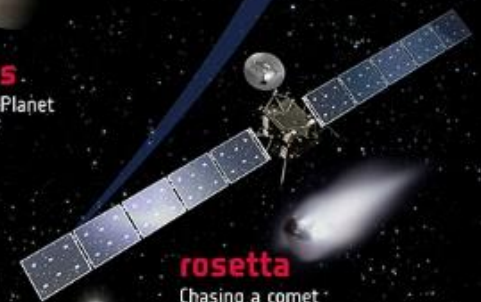


mars express
Investigating the Red Planet

cluster
Measuring Earth's magnetic shield

solar orbiter
The Sun up close

rosetta
Chasing a comet

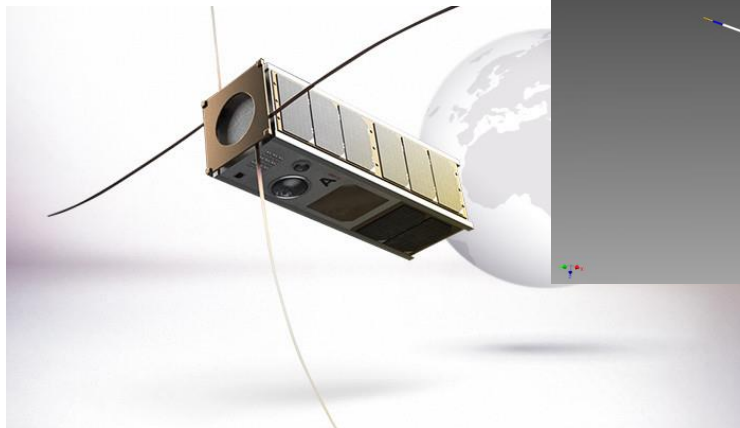


→ ESA'S FLEET IN THE SOLAR SYSTEM

The Solar System is a natural laboratory that allows scientists to explore the nature of the Sun, the planets and their moons, as well as comets and asteroids. ESA's missions have transformed our view of the celestial neighbourhood, visiting Mars, Venus, and Saturn's moon Titan, and providing new insight into how the Sun interacts with Earth and its neighbours. The Solar System is the result of 4.6 billion years of formation and evolution. Studying how it appears now allows us to unlock the mysteries of its past and to predict how the various bodies will change in the future.

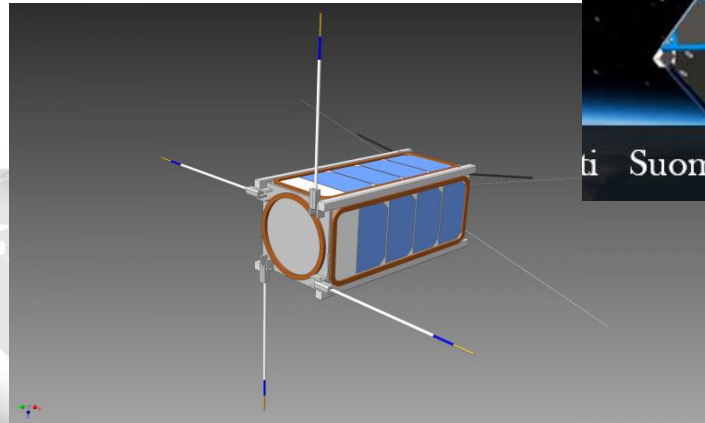
Aalto University's cubesat program

Aalto-1



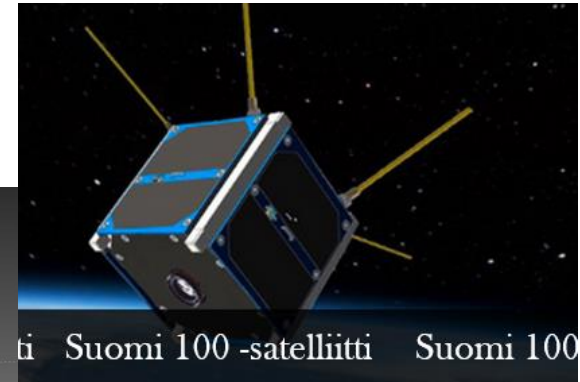
6/2017

Aalto-2



4/2017

Suomi 100



3.12.2018 (Falcon-9)

Suomi 100 left from Aalto almost exactly two years ago (11.9.2018)



WELCOME TO SPACE

