



TAL TECH

TALTECH SPACE CENTRE, TALLINN, ESTONIA

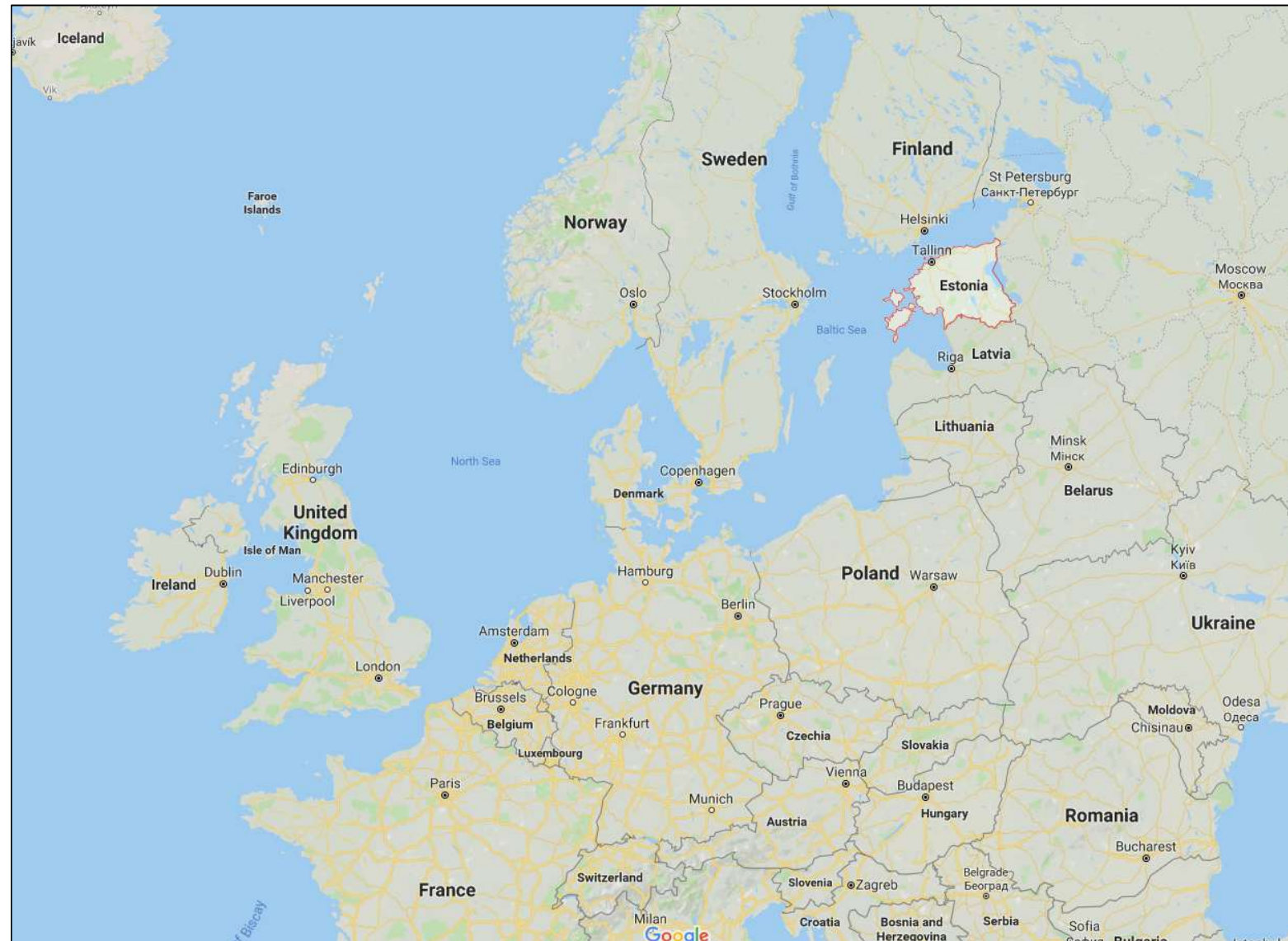
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**TALLINN UNIVERSITY
OF TECHNOLOGY**

Estonia



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Dr Adrian Venables



KÜBERKAITSELIIT
ESTONIAN CYBER DEFENCE LEAGUE

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- **E-mail:** adrian.venables@taltech.ee
- **Former Role:** Royal Navy Communications, Electronic Warfare and Intelligence Officer
- **Current Role:** Senior Lecturer at TalTech / Cybersecurity Masters Programme Manager / Head of Space Centre
- **Other roles:** Official Supporter – Estonian Cyber Defence League
- **Research focus:** The role of space as a domain of operations within the digital Information Environment
- **Topics:** The use of the space domain as a means to achieve strategic objectives in cyberspace

THE IMPORTANCE OF SPACE CYBERSECURITY

- **Kinetic attacks on space vehicles are highly undesirable**
- **Space vehicles are highly vulnerable to damage from space debris**
- **Debris from a destroyed satellite presents a kinetic threat to others**
- **Danger of a cascading effect denying space to all – Kessler Effect**



TALTECH – SPACE CYBERSECURITY OPERATIONS



- There is an increasing appreciation of space cybersecurity
- European Space Agency (ESA) recognises risk to space operations and satellites
- Estonian Government Space Office promoting Estonia's cybersecurity experience
- TalTech's vision is to be the Centre of Excellence for European space cyber security education

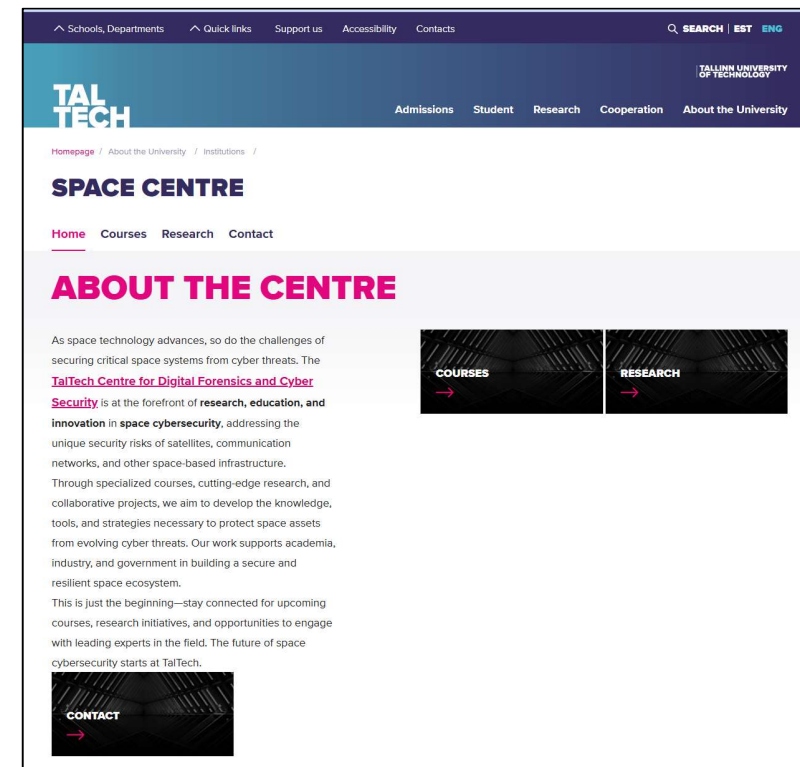
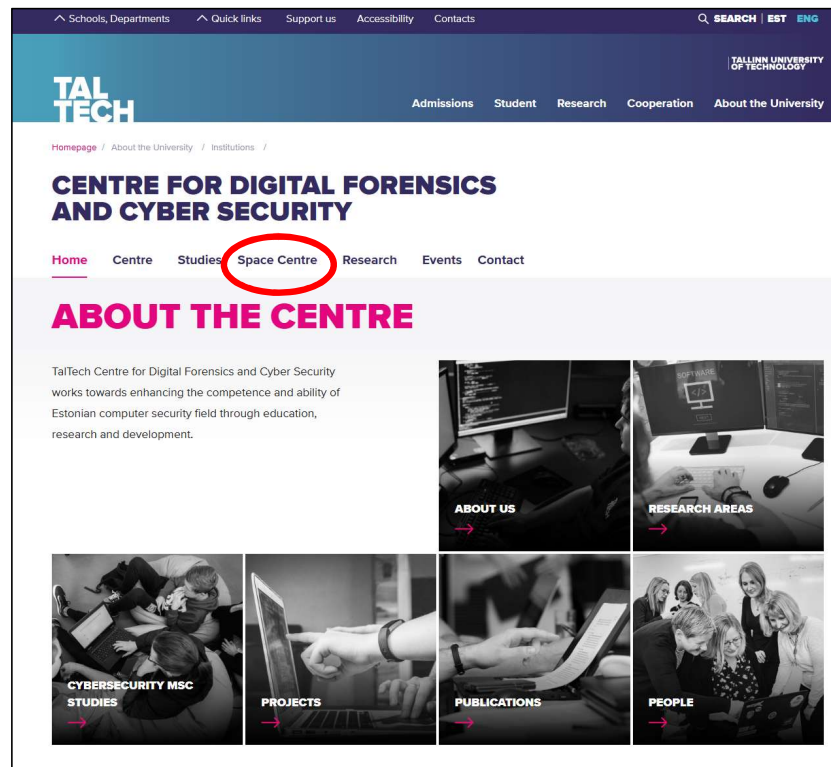
COMPOSITION OF THE CYBERSECURITY MASTERS PROGRAMME 2026

- TalTech cybersecurity masters programme now includes space cybersecurity
- TalTech benefits from a satellite ground station and local space industries
- 8 week Fundamentals of space cybersecurity introduced in 2026
- 16 week Fundamentals of space cybersecurity course planned for 2027
- Further courses planned
 - Space cybersecurity exercises
 - Ground station operations



TALTECH SPACE CENTRE

- Space Centre run by the Cybersecurity Research Group
- satellite.taltech.ee and satelliit.taltech.ee directs to space centre's web page



TALTECH SPACE CENTRE - INFRASTRUCTURE

- The ground station contains
 - Uplink transmitter frames formatting and transmissions
 - Decoded collection frames from software modems
 - Direct control of all antenna rotators
 - Data and statistics recording
 - Software defined radios
 - Satellite pass tracking
 - Satellite orbit data

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TALTECH SPACE CENTRE - INFRASTRUCTURE



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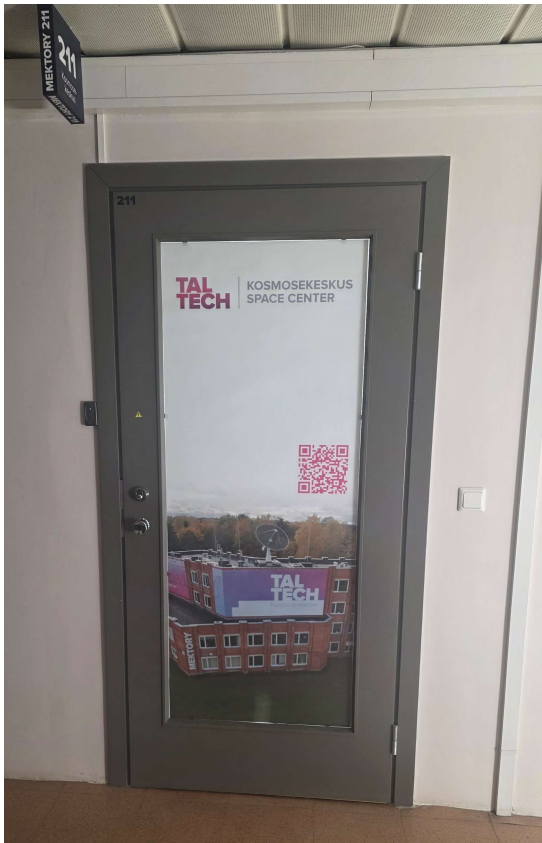
- **Downlink antennae**
 - **5m parabolic**
 - Pointing error while tracking LEO satellite less than 1.5 degrees
 - 435 MHz, S-band, X-band
 - **Double crossed and quadrifilar helix Yagi high directional, high gain antennas mounted on independent Yaesu azimuth/elevation rotators**
 - 145 MHz downlink
 - 401 MHz downlink
 - 240 MHz downlink
 - 433/868/915 MHz Long Range antennas
- **Uplink antenna**
 - **Yagi high directional, high gain antenna**
 - 435 MHz transmitter for AX25 at 9600 bps, 100 mW output power
 - 1kW power amplifier

TALTECH SPACE CENTRE –RESEARCH OPPORTUNITIES

- **Developing new capabilities, such as**
 - **Additional radio protocols**
 - **Radio protocol vulnerability testing**
 - **Tracking of objects such as high altitude drones or balloons**
 - **Satellite specific communication modules**
 - **Radio astronomy**



TALTECH SPACE CENTRE –CURRENT ACTIVITIES



- **Current student research theses**
 - **ESTCUBE-3 Requirements Elicitation, Use Case Development and implementation of user authentication and authorisation**
 - **Investigation into security of satellite communications**
 - **Encryption of ESTCUBE-3 communications**
 - **Integrity of small sat firmware supply chain (RIA funding)**
 - **Development of space cybersecurity exercises utilising ESA's 'Space Shield' methodology (RIA funding)**

ESTONIAN SPACE ECOSYSTEM – STUDENT SATELLITE PROGRAMME

- Estonia's Student Satellite Programme was founded in 2008 and plays a key role in developing Estonia's space capabilities and inspiring a new generation of engineers and scientists
- Its primary activities includes the development and construction of scientific satellites. It launched satellites in 2013 and 2023
- The Estonian Student Satellite Foundation will launch next Strategic Upgrades Test Satellite (SUTS) in 2027
- This will be followed by the ESTCUBE-3 Satellite in 2028



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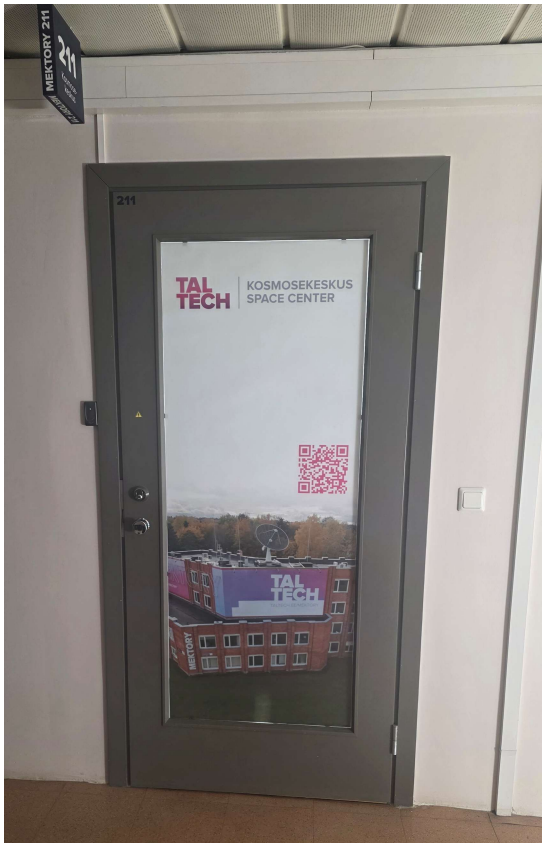


TALTECH SPACE CENTRE –FUTURE ACTIVITIES



- **Planned Microdegree in Space Operations (In Estonian)**
- **EEV5010 - Electromagnetic influence, noise and measurement**
- **IEE2560 - RF Electronics**
- **IEE2580 - Antennas and Radio propagation**
- **IEE2610 - Communication Theory**
- **ITC1701 - Fundamentals of Space Cybersecurity**
- **ITC8007 - Intelligence Methods for Cyber Professionals**
- **UTT0110 - Mechatronics and Smart Systems Project**

TALTECH SPACE CENTRE –ACTIVITIES



- **TalTech Innovation Festival – 6 May 2026**
- **Latitude 59 – 21-22 May 2026**
- **Presentation to Maltese Government – 7-10 July 2026**
- **International Aeronautical Congress – Turkey – 5-9 October 2026**
- **Software Defined Space Conference – 27-29 October 2026**
- **Collaboration visit to University of Adelaide – January 2027**

SUMMARY

- **TalTech's cybersecurity masters programme now includes space cybersecurity**
- **The syllabus offers a comprehensive range of courses and provides additional flexibility and study options to students**
- **This will ensure that the cybersecurity masters programme remains relevant to the needs of the cyber security industry in the future, whilst the new courses on space cybersecurity will provide a unique selling point**
- **The satellite ground station offers a unique facility for engineering and digital communication courses**

ANY QUESTIONS?



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