ESPE study line course matrix

Courses in blue are TS courses in Measurement Technology in the corresponding study line

Courses in green are TS courses in Physical Large-Scale Structures and Processes in the corresponding study line

Courses in italics (+ possibly a colour) only have partial content corresponding to the category

Courses in regular black font are elective courses (for the specific study line)

Approach / Study line	Instrumentation	Data processing	Physical and mathematical modelling
Earth Observation	Learn how to design instruments for climate and environmental monitoring. • ***30350 Remote sensing (mandatory)*** • 30340 Radar and Radiometer Systems • 30510 GPS, GIS, and Setting out	Learn about methods and data analysis techniques for climate and environmental monitoring. • **30350 Remote sensing (mandatory)** • 02456 Deep learning • 02506 Advanced Image Analysis • *30340 Radar and Radiometer Systems* • 30540 Mapping from Aerial and Satellite Images • 02409 Multivariate Statistics • 02417 Time Series Analysis • 02450 Introduction to Machine Learning and Data Mining • 02471 Machine learning for signal processing • 30545 Analysis of spatial and temporal data within geoscience • 30574 Earth observations for monitoring changes • 30760 Inverse Problems and Machine Learning in Earth and Space Physics	Learn how to use modelling to improve climate and environmental monitoring. • 25302 Physical Oceanography • 30552 Satellite Geodesy • 30745 Earth and Planetary Magnetism • 30752 Cryosphere physics and observation • 30755 Climate change - physics and observations • 12320 Hydrology
Earth and Planetary Physics	Learn how to design instrumentation to study the physics of Earth and other planets. • *30710 Near-surface Crustal Gravity and Magnetism* • 30310 Space System Engineering • 30350 Remote Sensing • 34757 Unmanned autonomous systems	Learn about methods and data analysis techniques for Earth and planetary science and prospecting. • 02610 Optimization and Data Fitting • 30554 Global Navigation Satellite Systems • *30710 Near-surface Crustal Gravity and Magnetism* • 30760 Inverse Problems and Machine Learning in Earth and Space Physics • *30745 Earth & Planetary magnetism* • 02409 Multivariate Statistics • 02417 Time Series Analysis • 02450 Introduction to Machine Learning and Data Mining • 02456 Deep learning • 02686 Scientific Computing for differential equations • 02687 Scientific Computing for ordinary and partial differential equations • 30350 Remote Sensing • 30540 Mapping from Aerial and Satellite Images • 30545 Analysis of spatial and temporal data within geoscience	Learn how to use modelling to understand geophysical processes and support efficient prospecting. • 30552 Satellite Geodesy • 30561 Physical Geodesy • 30745 Earth and Planetary Magnetism • 30752 Cryosphere physics and observation • 10314 Magnetism and Magnetic Materials • 10346 Continuum Physics • 41111 Hydrodynamics 2 • 30428 Advanced electromagnetics • 30757 Atmospheric plasmas

Approach / Study line	Instrumentation	Data processing	Physical and mathematical modelling
Mapping and Navigation	Learn how to design instrumentation for mapping and navigation. • 30510 GPS, GIS and Setting out • *30350 Remote Sensing*	Learn about methods and data analysis techniques for mapping and navigation. • 30350 Remote Sensing • **30540 Mapping from Aerial and Satellite Images (mandatory)** • 30554 Global Navigation Satellite Systems • 30574 Earth observations for monitoring changes (EO4Change) • 02409 Multivariate Statistics • 02417 Time Series Analysis • 02506 Advanced Image Analysis • 30545 Analysis of spatial and temporal data within geoscience • 30564 Summer School in Physical Geodesy and Earth Observation	Learn how to use modelling to generate and utilize maps and navigation products and services. • 30552 Satellite Geodesy (mandatory) • 30561 Physical Geodesy (mandatory) • 30752 Cryosphere physics and observation • 30720 Space Physics - Physics of the space environment • 30755 Climate change - physics and observations
Space Research	Learn how to design and develop instruments to study the Universe, including our Solar System. • **10200 Structure and dynamics of materials studied with X-rays and neutrons** • **30320 Spacecraft instrument systems ~~(mandatory)~~** • *10209 X-ray and Neutron Experiments at International Research Facilities* • *10255 Advanced 3D X-ray imaging* • 30300 Introduction to Spacecraft Systems and Design • 30340 Radar and Radiometer Systems • *30350 Remote Sensing* • *(47336 Applications of X-ray and neutron scattering)*	Learn about methods and data analysis techniques for astrophysics and Solar System exploration. • 02610 Optimization and Data Fitting • 30330 Image Analysis with Microcomputer • 30794 Astrophysical Data Analyses • 01418 Introduction to Partial Differential Equations • 02409 Multivariate Statistics • 02417 Time Series Analysis • 02450 Introduction to Machine Learning and Data Mining • 02456 Deep learning • 02506 Advanced Image Analysis • 02686 Scientific Computing for differential equations • 02687 Scientific Computing for ordinary and partial differential equations • 10350 Numerical studies in physics • 30350 Remote Sensing • *30340 Radar and Radiometer Systems*	Learn how to use modelling to describe and understand the physics of our Universe, including galaxies, X-ray binaries, and the Solar System. • 10405 Theory of relativity • 30428 Advanced electromagnetics • 30720 Space Physics - Physics of the space environment • 30790 Observational X-ray Astrophysics • 10112 Advanced Quantum Mechanics • 10122 Statistical Physics • *10209 X-ray and Neutron Experiments at International Research Facilities* • 10346 Continuum Physics • 10350 Numerical studies in physics • 10400 Plasma Physics • 30757 Atmospheric plasmas • 41111 Hydrodynamic 2 • 41320 Advanced fluid mechanics
Space Systems Engineering	Learn how to design, develop, and qualify (possibly including “proof of concept”) scientific space instruments for research and exploration. • **30300 Introduction to Spacecraft Systems and Design (mandatory)** • ***30310 Space Systems Engineering (mandatory)*** • 30320 Spacecraft instrument systems • 30340 Radar and Radiometer Systems • *30350 Remote Sensing*	Learn about methods and data analysis techniques relevant to satellite systems. • ***30310 Space Systems Engineering (mandatory)*** • 30330 Image Analysis with Microcomputer • *30340 Radar and Radiometer Systems* • 30350 Remote Sensing • 30545 Analysis of spatial and temporal data within geoscience • 30554 Global Navigation Satellite Systems	Learn how to design and develop scientific space missions for research and exploration. • 30720 Space Physics - Physics of the space environment • 30745 Earth & Planetary magnetism • 30752 Cryosphere physics and observation • 30790 Observational X-ray Astrophysics • 30552 Satellite Geodesy30755 Climate change - physics and observations